Vol. 37 Toronto, December 12, 1923 No. 50

Contract Record and Engineering Review

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DEC 14 19

Caledonia Road Hamilton

When the Ontario Department of Highways planned the Provincial Highway System, they decided on Hamilton as the chief centre of these Highways in Southern Ontario. Most of the highways radiating from Hamilton were completed last year. The Caledonia Road however, was one of the two left for completion in 1923.

The Caledonia Road runs south from the top of the Incline Railway and carries a large amount of milk traffic daily to Hamilton as well as bus services from Hamilton to Caledonia, Hagersville, Port Dover, Cayuga and other points. In constructing this road of Hot-Mix Asphalt over a macadam base, the Department has again shown their confidence in this type of road for all kinds of traffic. This 6½ miles of highway was built by the Hamilton Contracting Company Limited who used Imperial Asphalt throughout.

ROAD ENGINEERING DEPARTMENT

Imperial Oil Limited

Toronto Canada

Three views on the Caledonia Road, Hamilton. The centre picture taken at the top of the "Mountain" looking towards Hamilton.

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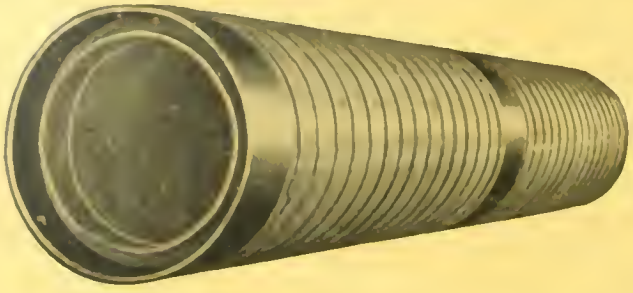
WOOD PIPE HAS BEEN PERFECTED

EFFICIENCY!
Steel
Double-Coupling
eliminates
all leaks



DURABILITY!
Double
Burlap Jacket
secures permanency
in all soils

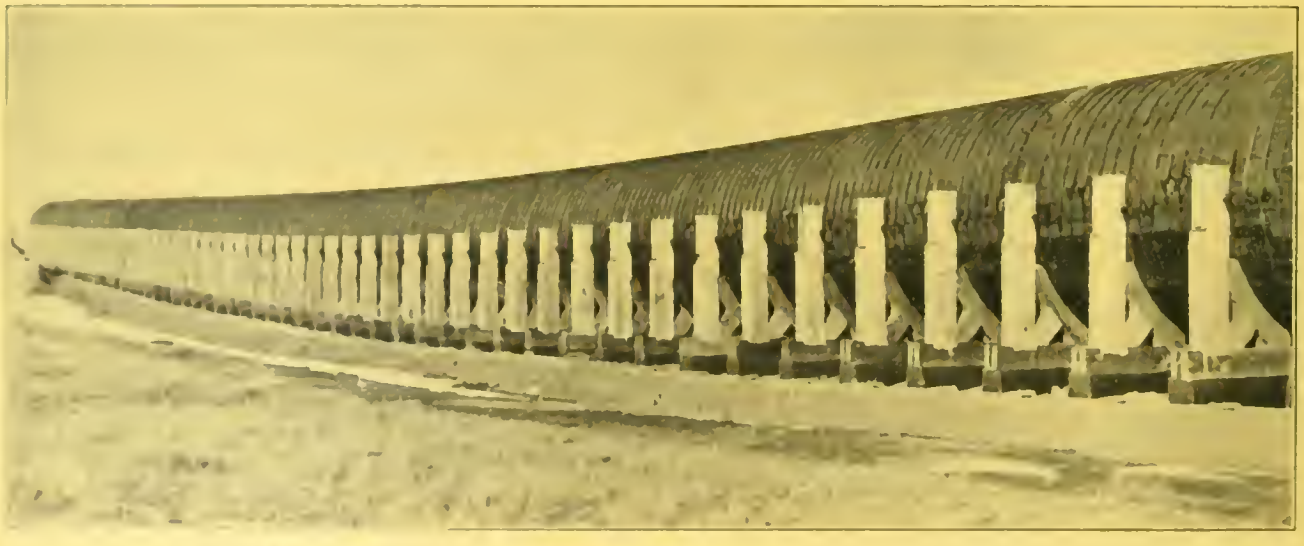
TWO MILES of GOOD PIPE for the PRICE of ONE

Those who cling to the theory that a combination of efficiency and durability is possible only with Metal Pipe at a fancy price, have not fully investigated the improved standard of Wood Pipe. RESULTS in several Western Municipalities are most convincing.

Wire Wound or Continuous Stave

PIPE

TANKS SILOS

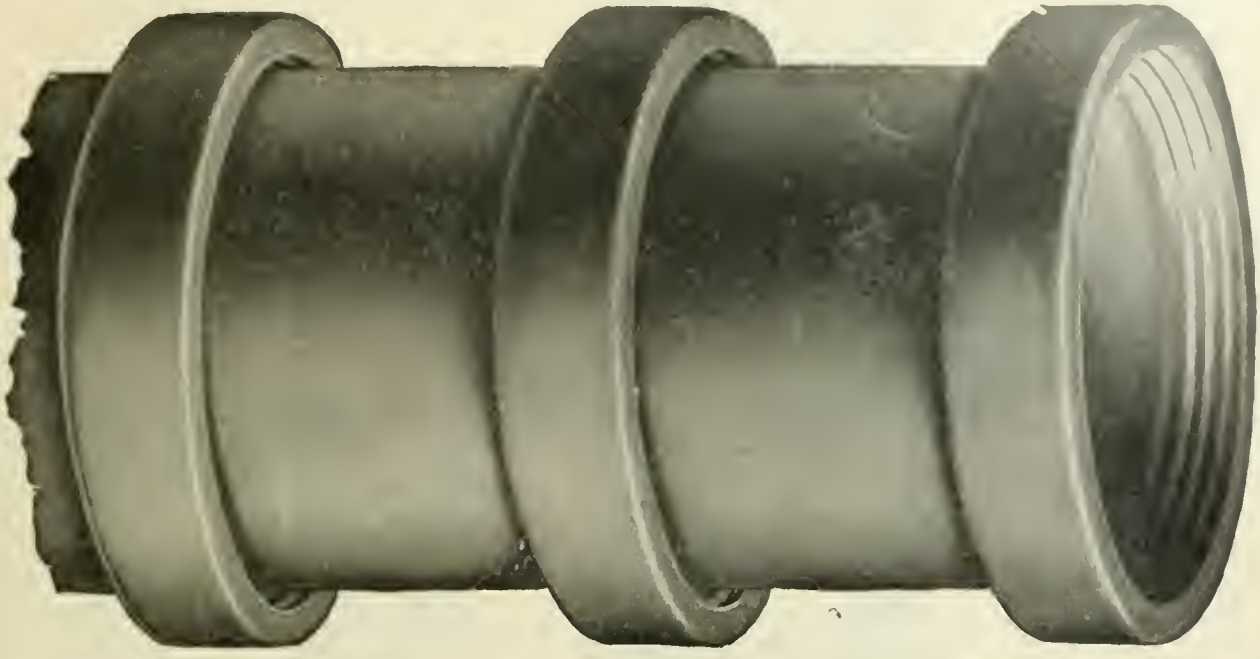


Concrete Pipe 10 feet in diameter, built by us for Lethbridge Northern Irrigation District (Alberta)

Let us quote on your requirements—Catalogue forwarded on request.

CANADIAN PIPE COMPANY, LIMITED

550 Pacific St., VANCOUVER, B.C.



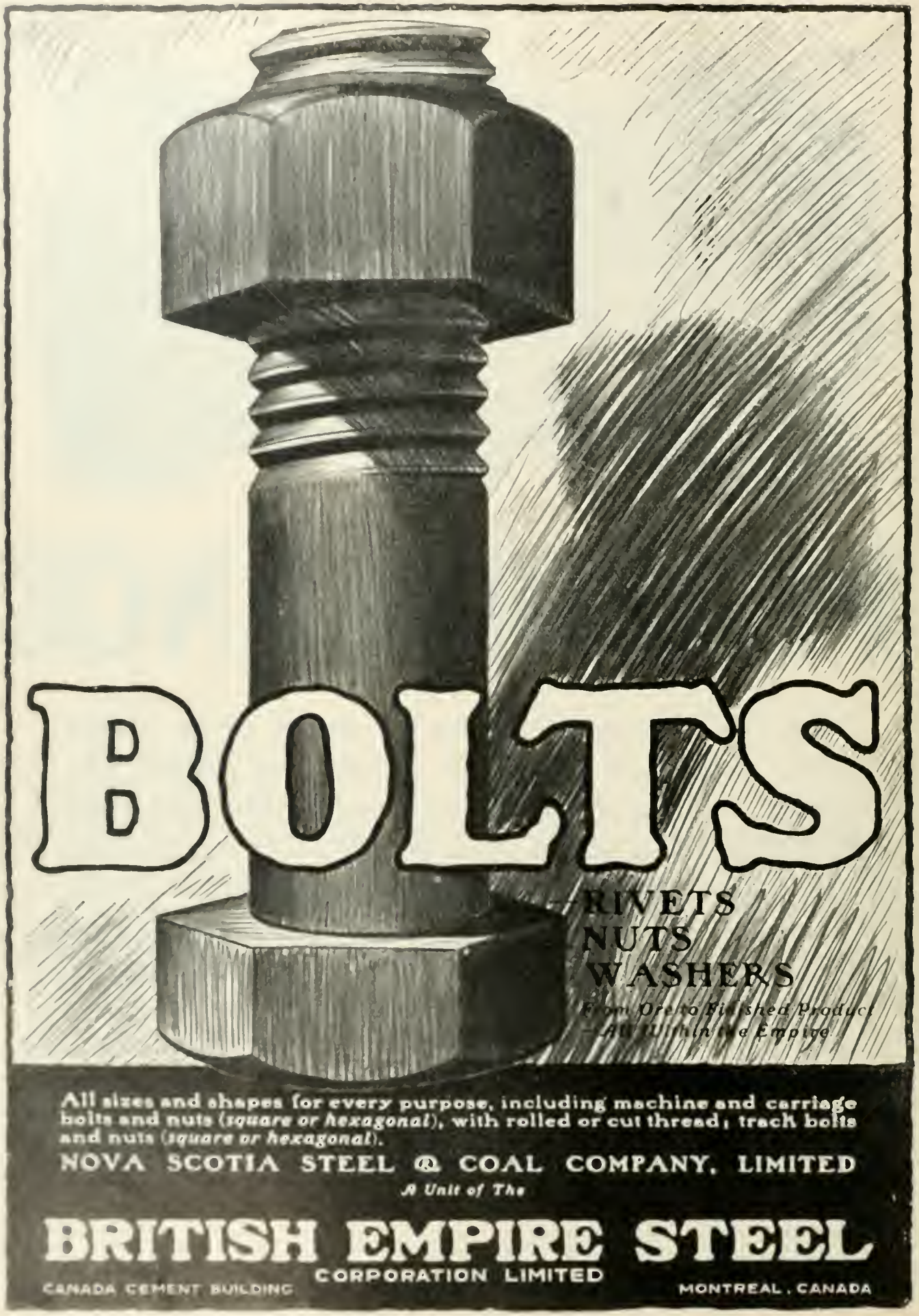
PERFORMANCE

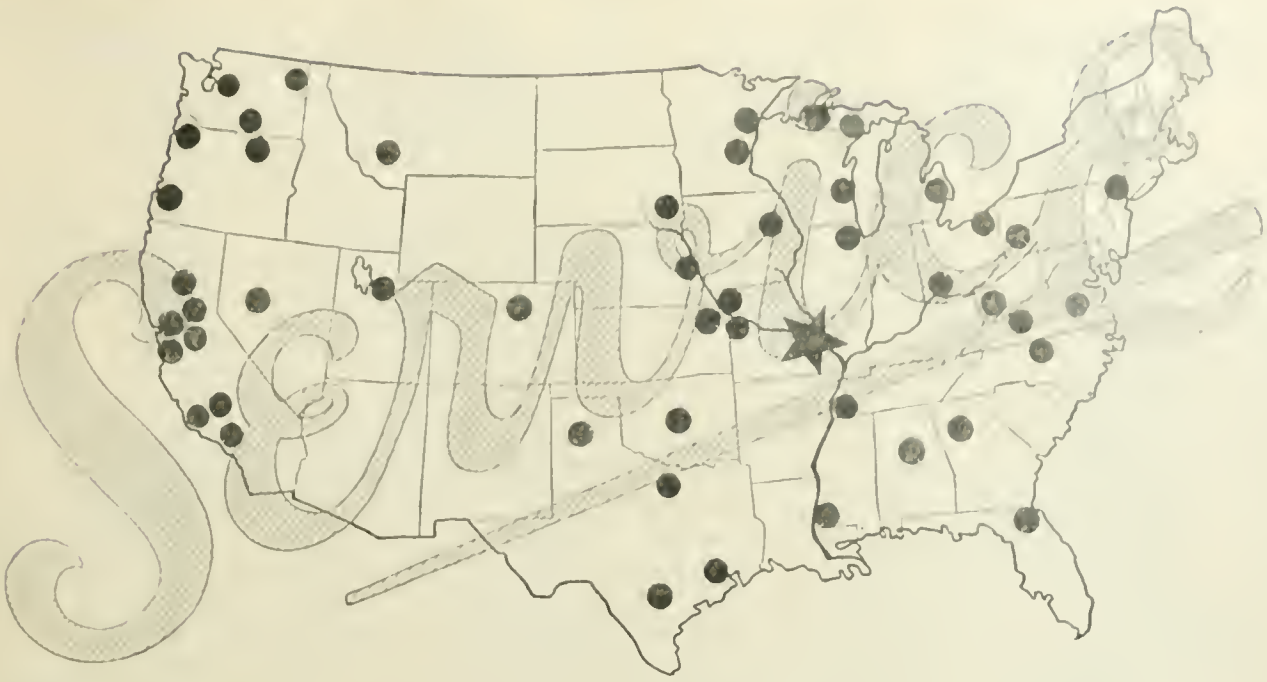
Vitrified Clay Pipe is used for the sewers of the largest cities in the world because of its record of PERFORMANCE. Other materials have been tested on the strength of a PROMISE but have failed and have been discarded. Experience gained by the failures strengthens the opinion of the City Engineers that for PERMANENT and EFFICIENT SEWERS, Vitrified Clay Pipe must be specified, as the cost of reconstructing a sewer is seldom less than twice the original cost.

PERFORMANCE is better than PROMISE

Vitrified Clay Pipe Publicity Bureau
9 Wellington St. E., Toronto

St. Johns, P. Q.
New Glasgow, N. S.


BOLTS
RIVETS
NUTS
WASHERS
From Ore to Finished Product
All Within the Empire
All sizes and shapes for every purpose, including machine and carriage bolts and nuts (square or hexagonal), with rolled or cut thread; track bolts and nuts (square or hexagonal).
NOVA SCOTIA STEEL & COAL COMPANY, LIMITED
A Unit of The
BRITISH EMPIRE STEEL
CORPORATION LIMITED
CANADA CEMENT BUILDING
MONTREAL, CANADA



Parts and service for the owners of BEST Tractors are available through dealers at the numerous conveniently located points as shown:

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Colusa
Hanford
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Oakland
Sacramento
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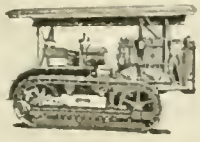
GEORGIA
Atlanta
ILLINOIS
Chicago
IOWA
Cedar Rapids
KANSAS
Kansas City
MICHIGAN
Detroit
Ironwood
MINNESOTA
Duluth
Minneapolis
MISSISSIPPI
Vicksburg
MISSOURI
Kansas City
St. Joseph
St. Louis
MONTANA
Butte
NEBRASKA
Omaha
NEVADA
Lovelock
NEW YORK
New York City
NORTH CAROLINA
Greensboro
OHIO
Cincinnati
Cleveland
OKLAHOMA
Oklahoma City
OREGON
Medford
Pendleton
Portland
PENNSYLVANIA
Pittsburgh
SOUTH DAKOTA
Sioux Falls
TENNESSEE
Memphis
TEXAS
Amarillo
Dallas
Houston
San Antonio
UTAH
Salt Lake City
VIRGINIA
Richmond
Roanoke
WASHINGTON
Seattle
Spokane
Walla Walla
WEST VIRGINIA
Charleston
WISCONSIN
Milwaukee



In order that dealers may always be in a position to quickly replenish their stock of parts, this Company maintains a distributing warehouse at St. Louis in the industrial center of the Country and conveniently located to all dealers.

From this point, as headquarters, there is controlled a corps of expert Field Engineers to assist dealers in rendering owners of BEST Tractors the service to which they are entitled.

C. L. BEST TRACTOR CO. SAN LEANDRO, CALIFORNIA

Distributors

H. L. Kaufman, Seattle, Wash. Hofius-Ferris Equipment Co., Spokane, Wash.
F. H. Hopkins & Co., Ltd., Imperial Bank Chambers, Victoria Square, Montreal, Canada

113-1223

BEST TRACTORS

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The following regulations apply to all advertisers:—Eighth page, every issue, three headings; quarter page, six headings; half page, twelve headings; full page, twenty-four headings

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Sturtevant, B. F. & Co.

Air Compressors
Canadian Ingersoll Rand Co.

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Standard Steel Construction Co

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Hamilton Bridge Works Co
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MacKinnon Steel Company
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Industrial Works

Buckets, Grab
Industrial Works

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Mussens Limited

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Sturtevant, B. F. & Co.

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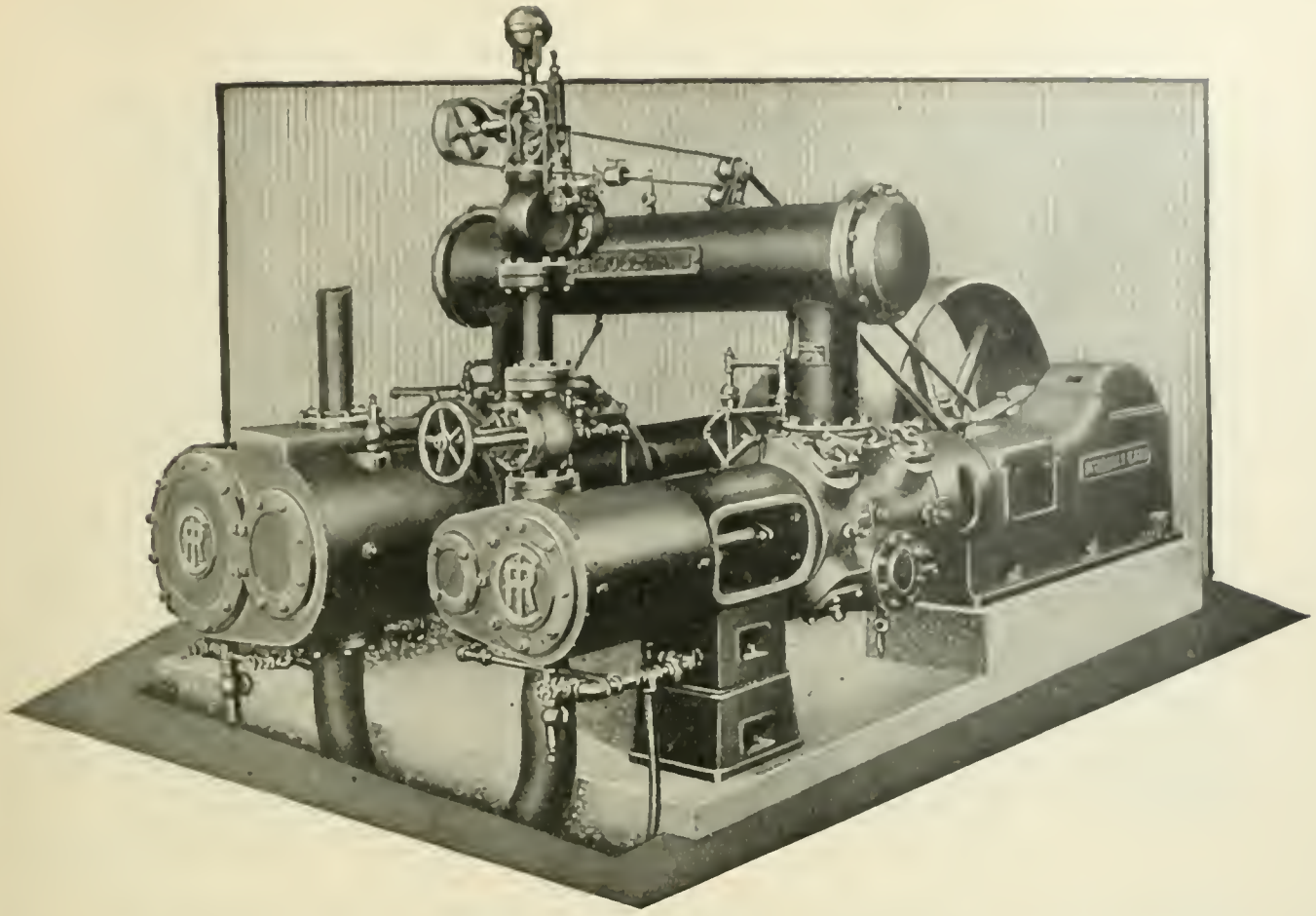

A New and More Efficient Compressor

To meet the demand for a high-class Steam-driven Compressor of larger capacity than our Class "FR-1" Straight-line type, we have designed the Class "PRS" Duplex Steam-driven Unit shown above.

These machines are of the enclosed dust-proof construction which characterizes our famous Class "PRB" and "PRE" Belt and Motor-driven Compressors. Frames, running parts, lubrication system and plate valve air ends are identical with those used on corresponding sizes of our belt and motor-driven units.

The steam ends are either simple or compounded as desired and are equipped with Ingersoll-Rand Balanced Piston Steam Valves. These valves are similar to those used on modern locomotives and permit the efficient use of super-heated steam as well as the low pressures common in the past. They require less power to operate and have much longer life than any other types.

Speed and Pressure Governing Devices or a combination of Speed and Pressure Governor and our Free Air Unloader can be furnished as desired.

Class "PRS" Compressors provide a simple, efficient and thoroughly reliable unit particularly adapted for mines, construction jobs or industrial plants where steam is used. They are readily converted to power drive when desired and are therefore well suited for use in localities where hydro-electric plants are under construction or where a combination of steam and motor drive is desirable.

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Winnipeg Nelson Vancouver

Ingersoll-Rand

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McIntyre & McIntyre

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Hepburn, Ltd., John T.

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Canadian Equipment Co.
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Canadian Inspection & Testing Laboratories
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Milton Hersey Company

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Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd

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Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

Kilns
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Standard Lime Co.

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Canadian Equipment Co.
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Vancouver Wood Pipe & Tank Company

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Gartshore, Thompson Pipe Co.
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Luxfer Prism Co.

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Goldie & McCulloch Co.
Hepburn, Ltd., John T.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Koehring Co., of Canada
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Waterous Engine Works Co.

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McGovern, T. J.
Mussens Limited

Rails
Gartshore, John J.
Hopkins & Co., Ltd., F. H.
Mussens Limited

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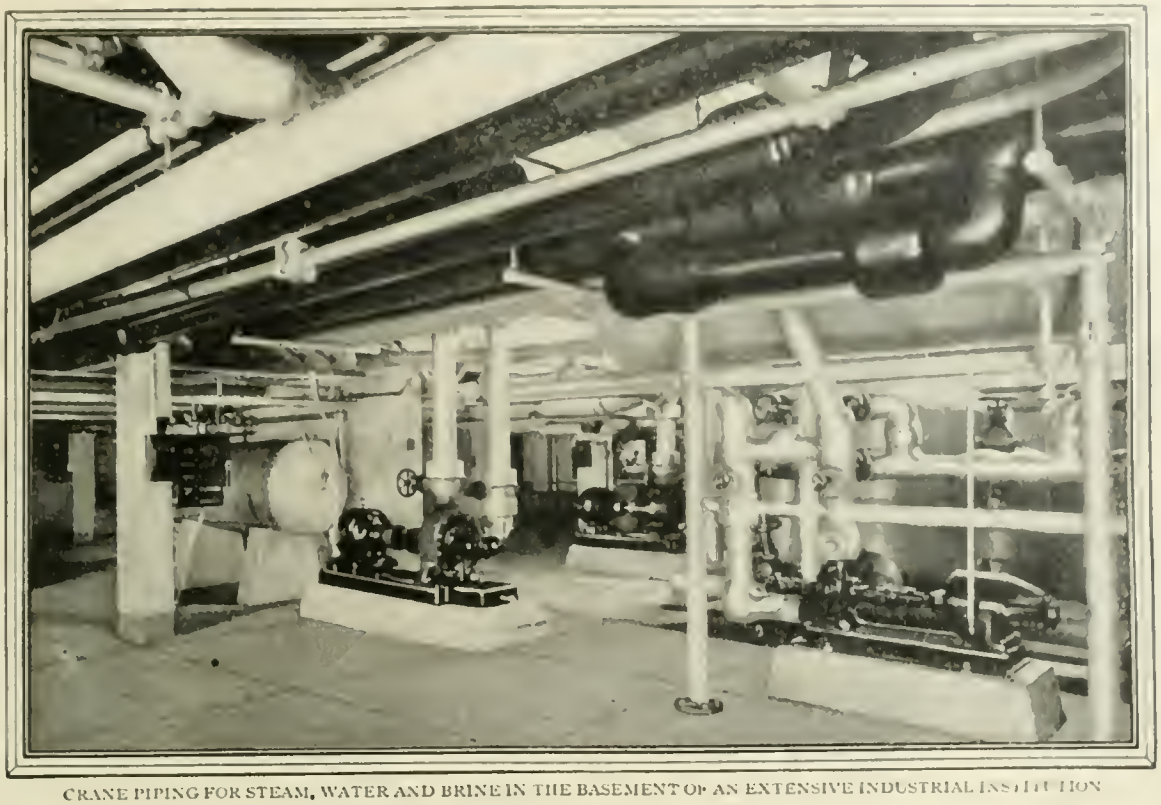

CRANE PIPING FOR STEAM, WATER AND BRINE IN THE BASEMENT OF AN EXTENSIVE INDUSTRIAL INSTITUTION

BROAD EXPERIENCE SIMPLIFIES PROBLEMS

Many of your perplexing problems in plant engineering have been met and solved, perhaps, in other installations. As the medium through which much of this development is carried out, Crane Ltd. has acquired valuable experience and skill in the planning and producing of piping equipment of every description. Crane engineers are further aided by intensive research, in the design and manufacture of valves, fittings and specialties to make the most efficient systems for every piping need of water, steam, gas, oil or air.

CRANE

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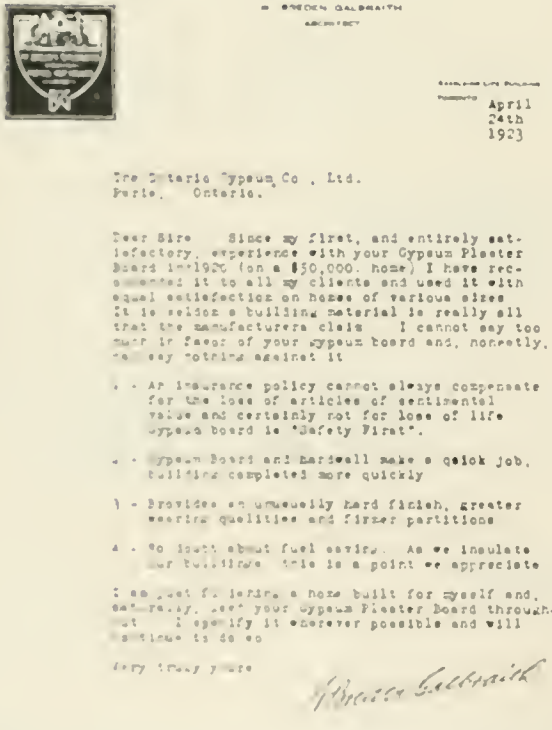

April
24th
1923

The Ontario Gypsum Co., Ltd.
Paris, Ontario.

Dear Sirs Since my first, and entirely satisfactory, experience with your Gypsum Plaster Board in 1920 (on a $50,000. home) I have recommended it to all my clients and used it with equal satisfaction on homes of various sizes. It is seldom a building material is really all that the manufacturers claim. I cannot say too much in favor of your Gypsum board and, honestly, can say nothing against it.

1 - An insurance policy cannot always compensate for the loss of articles of sentimental value and certainly not for loss of life. Gypsum Board is "Safety First".

2 - Gypsum Board and Hardwall make a quick job, building completed more quickly.

3 - Provides an unusually hard finish, greater wearing qualities and firmer partitions.

4 - No talk about fuel saving. As we insulate our buildings this is a point we appreciate.

I am just finishing a home built for myself and, naturally, used your Gypsum Plaster Board throughout. I specify it wherever possible and will continue to do so.

Very truly yours

Gilbert Galbraith

Your friend - - the Architect

Below, we reproduce a letter which should be read by every dealer of building supplies in Canada.

Because it expresses the attitude not only of the writer but of the profession as a whole.

Do you catch the significance of it? Do you see how the architect becomes a salesman for the dealer who handles Gypsum Products?

Do you want some of this profitable business? Then write us today, and we shall be pleased to forward you the full facts.

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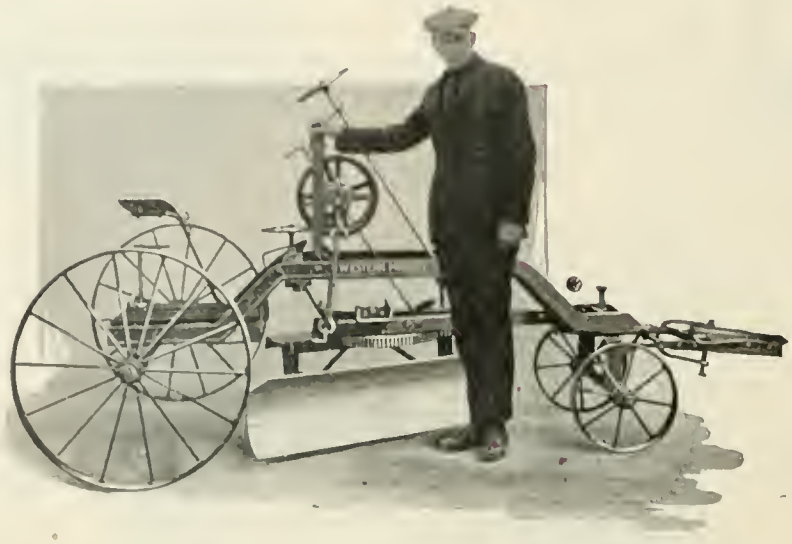
Let the Midget Keep Your Roads in Shape



Western

That's Why

Here is a light road grader which we cannot recommend too highly—**the Western Midget.** It is a one-man, two-horse machine which has been used very successfully in Canada in the maintenance of earth roads. If your work is not heavy enough for the famous **Little Western Steel Grader** or the still larger grader of the well known Western type, you will find the **Midget** a most efficient tool to install.

One Midget grader properly used will keep a surprisingly large mileage of earth roads in excellent condition and at very low cost.

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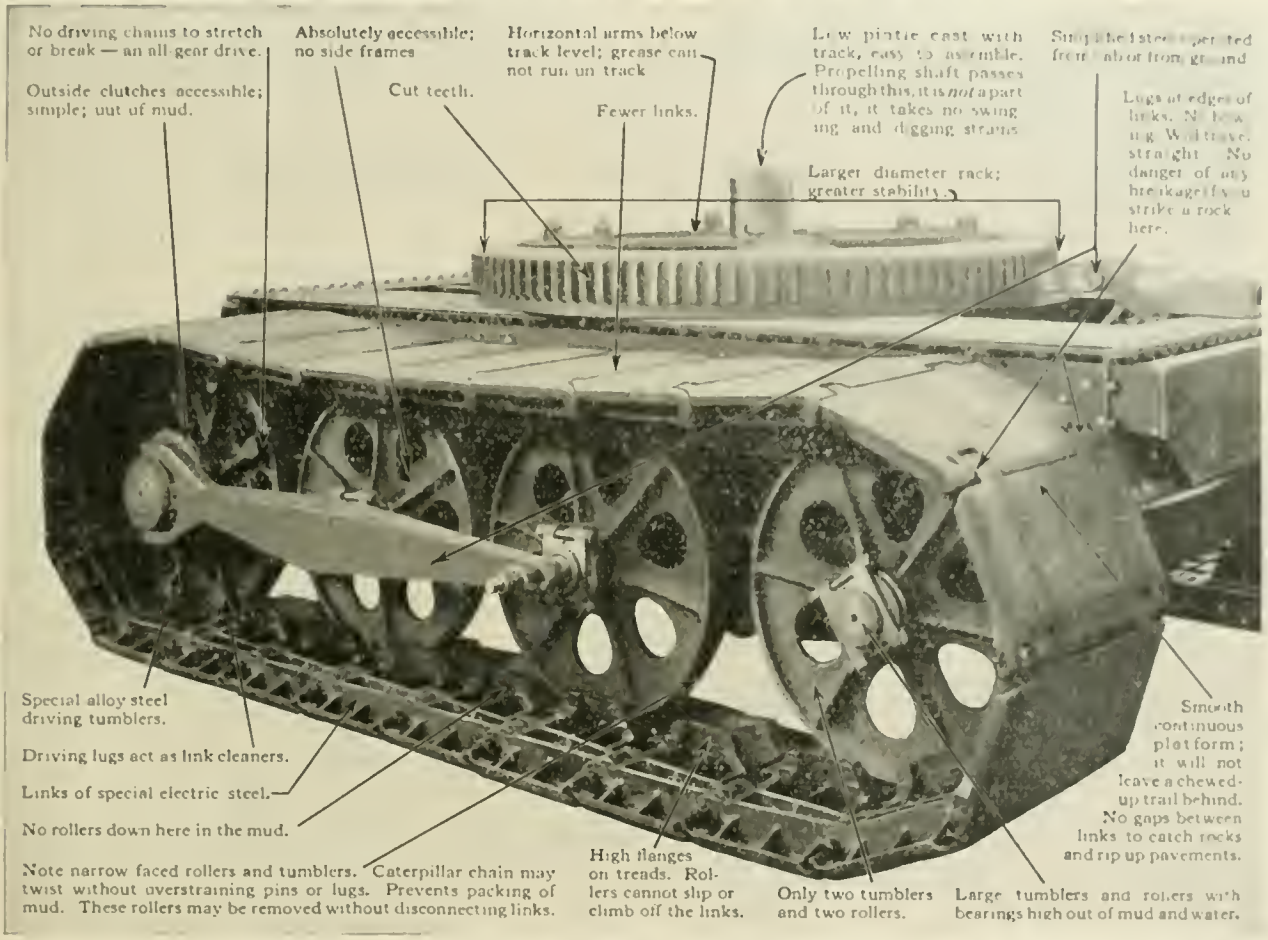
MUSSENS LIMITED

Who Builds the Best Revolving Shovel MOUNTING

Read These Points and Decide for Yourself:


No driving chains to stretch or break — an all-gear drive.
Outside clutches accessible; simple; out of mud.
Absolutely accessible; no side frames
Horizontal arms below track level; grease can not run on track
Cut teeth.
Fewer links.
Low pintle cast with track, easy to assemble. Propelling shaft passes through this, it is *not* a part of it, it takes no swing ing and digging strains
Larger diameter rack; greater stability.
Lugs at edges of links. No bowing. Will travel straight. No danger of any breakage if you strike a rock here.
Special alloy steel driving tumblers.
Driving lugs act as link cleaners.
Links of special electric steel.
No rollers down here in the mud.
Note narrow faced rollers and tumblers. Caterpillar chain may twist without overstraining pins or lugs. Prevents packing of mud. These rollers may be removed without disconnecting links.
High flanges on treads. Rollers cannot slip or climb off the links.
Only two tumblers and two rollers.
Large tumblers and rollers with bearings high out of mud and water.
Smooth continuous platform; it will not leave a chewed-up trail behind. No gaps between links to catch rocks and rip up pavements.

BUCYRUS Small Revolving Shovels are built in the following sizes:
20-B—$\frac{3}{4}$-yard. 30-B—1, 1$\frac{1}{2}$-yard.
50-B—1$\frac{1}{4}$ to 2-yard.
Also as Draglines, Clamshell Excavators, Cranes, Etc.

Send for Bulletin **C-D** and state which size you are interested in.

Here are a few more points not shown in this view:

POWER STEER operated entirely from the operator's seat, or if preferred, from the ground. Simple, positive—clutches all on outside, accessible.

LINKS AND PINS are *not* lubricated. Years ago this company abandoned this principle after thorough test had showed it increased rather than decreased wear.

UNDERFRAME of heavy structural steel built around a big center casting—most reliable construction known—no danger of expensive replacement in case of breakage.

The following features are found ONLY on Bucyrus Steam Shovels:
Outside Dipper Sticks and Box Girder Type Boom; Swing Engines in front, NOT in rear of Shovel; Two-Part Hoist; Frameless Caterpillars with fewer parts; Scale Chamber Boiler

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Established in 1880
A Special Plant Devoted Exclusively to Small Revolving Shovels
Railroad Type and Revolving Shovels of all sizes, Draglines Excavators, Trench Excavators, Dipper, Hydraulic and Placer Dredges, Spreader Plows, Wrecking Cranes, Etc.
531

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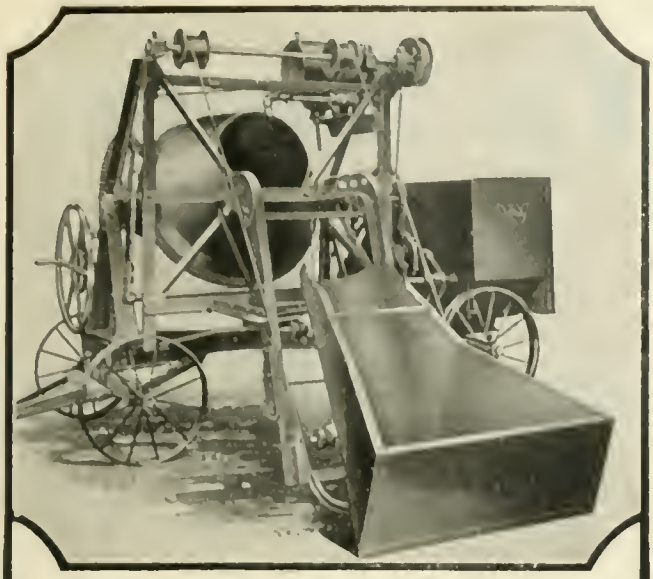

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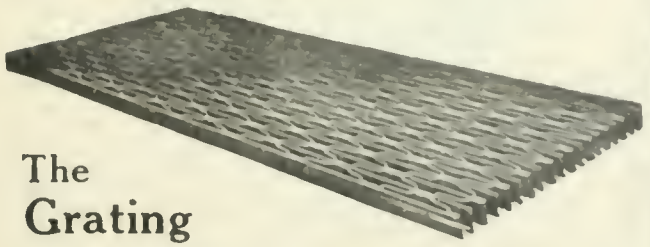
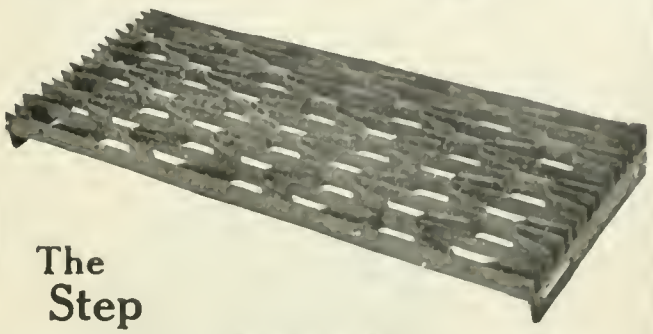


The Grating



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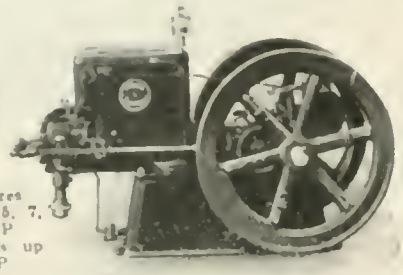

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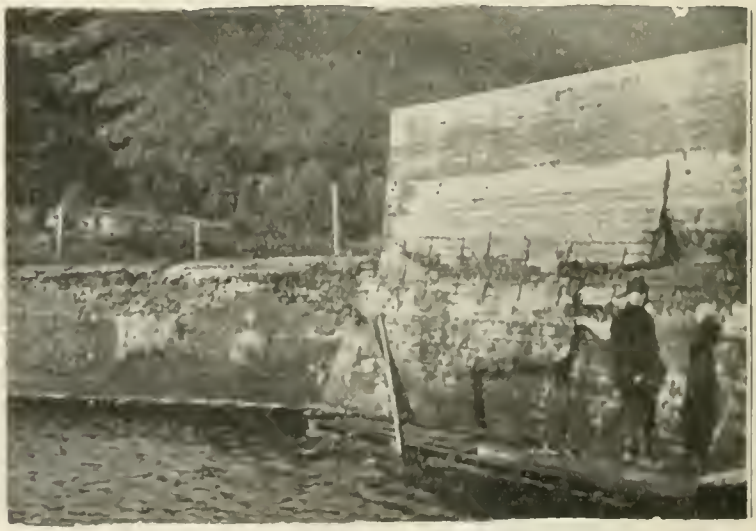

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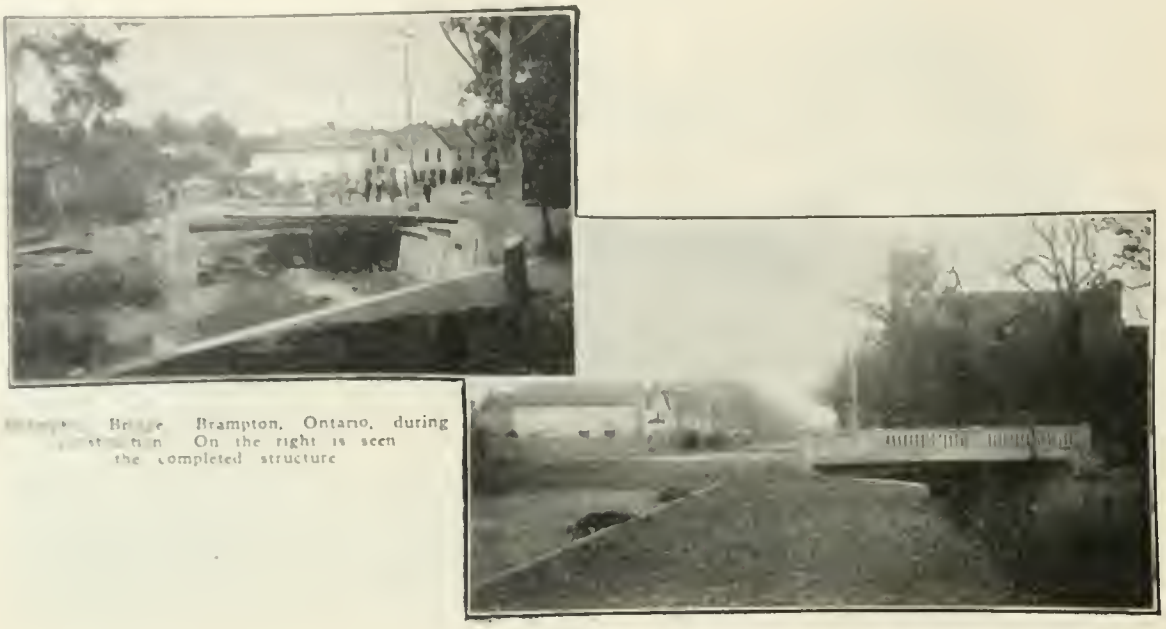

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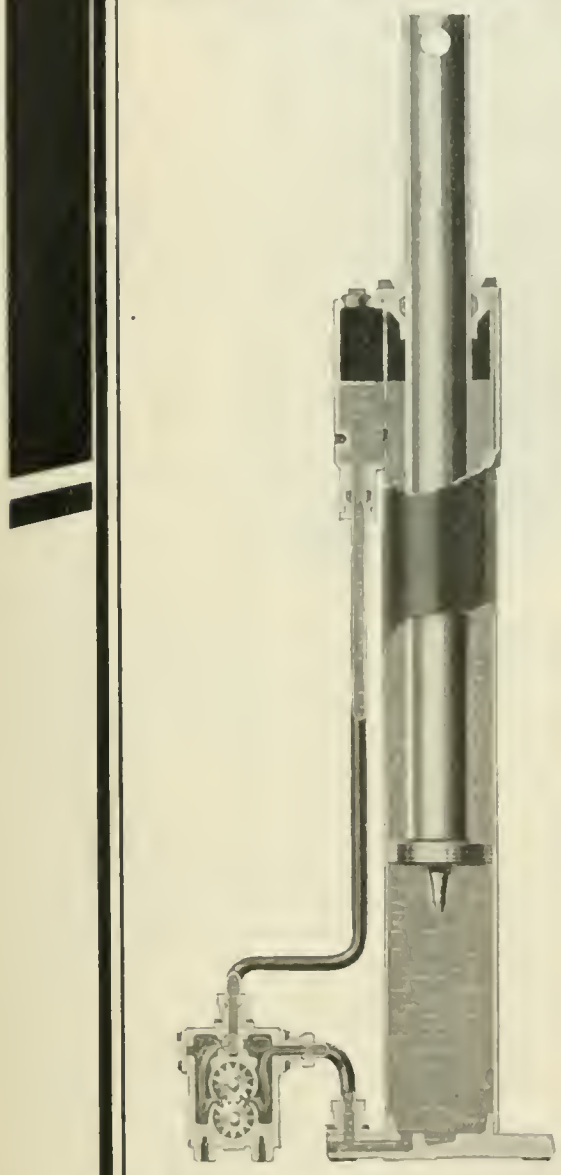

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Estimating the Cost of Fireproof Construction

Practical Data That Will Enable the Contractor to Figure on Hollow Tile, Gypsum or Concrete and Tile Fireproofing

By CHAS. F. DINGMAN

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Fireproof construction, or more properly speaking, fire-resistive construction, divides itself into three general types: terra-cotta, gypsum and concrete.

Brickwork is, of course, a form of fire-resistive construction; in fact, is the best known form, and also the most effective form of terra-cotta fire-resistive construction. A very helpful discussion of the cost of brickwork will be found in a brochure entitled "Brick, How to Build and Estimate," issued by the Common Brick Manufacturers' Association. It forms a particularly interesting sidelight upon the methods outlined in our own article, entitled "Estimating the Cost of Brickwork," which appeared in the Contract Record of August 23, 1922.

Terra-cotta and gypsum constructions are largely used for walls, floors, partitions and roofs and are usually placed by masons. These two types will be fully discussed in this article. Concrete fireproofing is, however, usually placed by laborers, and since the same general methods apply, it will be more fully discussed in a succeeding article.

Hollow Tile Fireproofing

The term fireproofing, as here used, includes all those forms of hollow terra-cotta building material that are commonly used, such as, flat and segmental floor-arches, roof arches, "book" tile, beam, girder—and column-covering, wall and partition tile, furring tile.

In taking off quantities of tile required for any piece of work, it is necessary to make some allowance for breakage in handling and in cutting to fit around openings, against jambs, etc. It is impossible to lay down any exact rules for figuring the breakage, it may vary all the way from one per cent to ten per cent but a good method is:

to allow 3% breakage for areas having no openings, no deductions for openings under ten square feet,

one-half of openings from ten to twenty-one square feet,

deduct full opening, if over twenty-one square feet and add enough tile to go once around the opening.

Practically all forms of hollow tile fireproofing can be figured and bought by the square foot or by the piece. If you buy by the piece, remember that you only need one 12 x 12 tile, no matter what the thickness, per square foot but one and one-half tiles, if you buy the 8 x 12 size.

"Book" tile, which are used for roofs where no heavy loads are to be carried, and are so called because their "tongue and groove" cross-section makes them resemble large books, usually come in 12 x 24 size, so that each tile will lay two square feet. They are usually placed upon a structural steel frame consisting of angles and tees, and therefore no form work or centering is required.

Furring tile usually come in the "split" form, i.e., a block resembling a partition block which is scored in such a manner that it can readily be split into two halves, each of which is a furring tile.

When figuring flat or segmental arches for estimating purposes, it is sufficient to take from the plans the number of square feet to be covered but, when listing tile for shipment to the work, it is necessary to carefully compute the number of skewbacks, key blocks, voussoirs, soffit tile, girder shoes, etc., that will be required.

The literature issued by such companies as the National Fireproofing Company contains such a wealth of information on that subject that it is unnecessary to encumber these pages with a repetition of it. However, it is essential that care should be taken to figure upon exactly the kinds of tile in each case that the specifications require; dense, porous or semi-porous, smooth-faced, scored, etc.

Cost of Handling

In earlier articles we have discussed very thoroughly the cost of hauling and knowing the weight of the various kinds of tiles likely to be used, it is a simple matter to determine the number that can be handled in a load. The cost of loading and unloading is not so simple a matter, since there is such a variety of weights to be considered and since it is possible for a man to handle a tile weighing thirty pounds about as quickly as one weighing twenty pounds.

The following tables provide the necessary data for estimating loading and unloading costs, hauling, etc.

Table 1. Weights of Hollow-Tile

	Partition, Lbs. per block	Book tile per sq. ft.
2 x 12 x 12	12	12
3 x 12 x 12	14	14
4 x 12 x 12	16	18
5 x 12 x 12	20	
6 x 12 x 12	22	
7 x 12 x 12	25	
8 x 12 x 12	28	
9 x 12 x 12	30	
10 x 12 x 12	35	
12 x 12 x 12	40	

Split furring tile weigh the same per block as a partition block of twice the thickness.

Floor Construction (Lbs. per sq. ft.)

			Const'n, Flat
2"			27
3"		27	28
4"		31	36
6"		35	39
12"		58	14

Where nails must be driven into brick walls to act as anchors for furrying, add four hours of mason's time per 100 nails, which will usually be spaced about 25 nails to the 100 sq. ft. of partitions.

Table 4. Hollow Tile Specialties

(Hours of Masons' Time per 100 sq. ft.—per 100 lin. ft.)

	Round Col. Covering	Square Col. Covering	Soffit Tile	Shoe Tile
2"	2.	2.5		
3"	2.5	3.		
4"	3.	3.5		
			1.5	1.5

In some localities it is practicable to have the laborers set the soffit tiles under the beams when putting up the forms but bricklayers are inclined to object to the practice. (Note.—Where "lip" skewbacks are not used, one soffit-tile will be required for each linear foot of steel beams).

Where the girders are to be fireproofing it will usually require two shoe tiles, or girder tiles, and one soffit tile for each linear foot of girder. Besides that when the girders extend more than three inches below the bottoms of the beams, it will be necessary to figure upon sufficient partition tile, or hollow bricks to fill the space between the top of the shoe tile and the under side of the floor construction.

Table 2. Labor Costs of Loading, Unloading, and Handling Hollow-Tile

General

A tile laborer's load is approximately	250 lbs.
A tile load is approximately	75 lbs.
A man wheeling loaded barrow moves	100 ft. per min.
A man pushing unloaded barrow moves	110 ft. per min.
A man carrying loaded hod moves	85 ft. per min.
A man carrying empty hod moves	100 ft. per min.

Loading Barrows from Pile or Unloading Barrows to Floor or Scaffold

(Labor-Hours per 100 square feet.)

	(1) Partitions	(2) Floor Tile.
2"	0.70	
3"	0.75	
4"	0.80	
6"	0.83	0.90
8"	0.85	0.95
10"	0.95	1.
12"	1	1.10
16"	1.10	1.15
20"	1.25	1.30

The cost of building scaffolds for partition work can be determined on the basis of one scaffold builder for each four masons; and for wall-furring, one scaffold builder for each three masons.

The cost of making and handling the mortar is, of course, the same as for the same grade of mortar when used for brickwork. (Note. The best results in hollow tile construction are obtained with a strong cement mortar to which enough lime-putty has been added to make it spread very freely. This works better than a lime and cement mortar made in the ordinary way).

Table 3. Laying Hollow Tile

(Masons' Time per 100 sq. ft.)

Thickness	Partitions	Furring	Segmental Arches	Flat Arches
2"	4.	3		
3"	4.5	4		
4"	5.5			
6"	6.5			
8"	7.		3	4.
10"	8.		4	4.
12"	9.		4.	5.
16"	10.		4	5.
20"	11.		5	6.
24"	12.		6.	7.
28"	13.		6	7

Table 5. Mortar Required

(Cubic Yards per 100 square feet.)

Thickness	Furring	Partitions Col. Covering Book Tile	Floor const'n
2"	.07	.10	
3"	.09	.12	
4"		.14	
5"		.15	
6"		.17	.17
7"		.20	.20
8"		.23	.23
9"		.26	.26
10"		.29	.29
11"		.33	.33
12"		.36	.36

This table is figured upon the basis of an average thickness of joints of ½ inch. It would be possible to construct a table giving the amount of mortar for any thickness of joints but, since the edges of the tiles are seldom straight, it is not practicable to maintain an exactly even joint and this table is, therefore, as nearly correct as working conditions warrant.

Table 6. Load Bearing Tile

Size	Weight per Square foot	Masons' Time per 100 sq. ft.	Cu. yds. Mortar per 100 sq.ft.
6 x 12 x 12	29	6	.26
8 x 12 x 12	34	7	.30
10 x 12 x 12	40	7.5	.38
12 x 12 x 12	52	8	.45

Load bearing tiles are used for outside wall construction as well as bearing partition construction, to take the place of brickwork. They are usually faced on the outside by stucco but sometimes smooth-faced blocks are used that require no other finish.

The cost of handling these tiles, except mason's time in laying, may be calculated from Table 2 by increasing the times given for partitions by ten per cent.

Interlocking tiles, of the Denison patented type, have come into very general use and are now made by several licensees. These licensees are glad to furnish much more detailed information as to the use

of interlocking tiles than is given here but Table 7 gives all of the necessary information for figuring the cost of handling and laying.

Table 7. Interlocking Wall Tile

Weight of 1 tile — 17 lbs
Corner tiles—2 required for each lin. ft. of corner
Jamb tiles—1 required for each lin. ft. of jamb
Bonding tiles—0.7 required for each sq. ft. of 16" wall

Quantities per 100 Sq. ft. of Wall

Thickness	Tiles	Bonding Tiles	Cubic Yards Mortar	Hours Masons' Time
8" tile wall	240		.30	9
8" backing to brick wall	180		.25	8.5
12" tile wall	320		.45	14.
16" tile wall	400	70	.63	21.
21" tile wall	530		.75	24

For each linear foot of jambs or corners, add 0.10 hour masons' time.

Figure cost of handling, unloading, etc., in the same manner as for an equal number of 4" partition blocks.

(Note.—The time for foreman on all hollow-tile work should be figured by the method previously indicated in connection with brickwork).

Forms or Centering

In fireproofing the term "centering" is probably in more general use than is the term "forms," though both have practically the same meaning. However, for hollow-tile floor arches, of all types, it is most usual to use forms which are merely assembled from scaffold-planks and "stringers," hung from the steel floor framing by means of adjustable wrought-iron hangers. The work is usually done by laborers.

For combination hollow-tile and concrete construction, it is usual to build up the form of planking which, because of the longer spans used, must be supported at regular intervals by "shores" or posts. The work may be done either by carpenters or handy laborers. For reinforced concrete or cast-in-place gypsum construction, it is usual to build a tightly constructed form of boards, supported by joists, posts, or other members may be necessary. This work is almost invariably done by carpenters.

Centering for Hollow Tile Arches

Centering for flat-arches is a very simple form of construction, particularly where the ceiling surface is kept level and carried on the line formed by the under surface of the skew-backs.

Stringers, usually built of two pieces of 2 x 6 timber, separated by 1" blocking at fairly close intervals, are usually used, though some builders use single stringers. The stringers are hung from the beams by wrought iron hangers, ¾ inch round rods being used, which are fitted with clips which attach to the upper flanges of the beams. Adjustment in length of the hangers is provided by a screw thread and nut at the top. Scaffold planks are then laid across the stringers to form the surface upon which the tiles are laid and which supports the tiles until the mortar in the joints has set and the arches become self-supporting.

When the specifications require that the arches must be cambered (usually the amount will not exceed ½ inch), additional stringers must be provided over the tops of the beams and the lower hangers supported at the center of the span. Then the skew-backs or soffit-tiles can be set at the beams, and the hangers drawn up in the middle so as to give the required camber. This is termed "camber-hung centering."

Centering for segmental arches is made up like flat arches but, in addition arch ribs, cut to the segmental ribs, cut to proper curve to fit, and covered with 1 inch strips, are placed on top of the planking in order to give the curved shape to the arch.

As it is usual in steel framed buildings to keep the spans between beams as uniform as possible very little cutting of the lumber is necessary and it would be possible to use all of the lumber over at least four times.

The figures in table 8 are the amount of lumber needed for one time; the cost of the material actually used will be found by dividing the quantity given by the number of times it can actually be used. This number cannot be determined without knowing the conditions under which the work is to be done. For instance, if you built a four-storey building this season and were pushing the work with any speed at all, you would probably put in enough forms for the first and second floors. Then the first floor forms would be re-used on the third-floor and roof, the second floor forms would be re-used on the fourth-floor. This is an average use of 2½ times. If you had no further use for them as centering, you could then credit the planks to the job at their depreciated value as second-hand scaffold-planks and the stringers as so much wood. On the other hand, if you are constantly installing hollow-tile arches, the stringers should have a very long life. The hangers should last indefinitely, so it is entirely a matter of judgment as to what proportion of their cost should be charged to any job. This is a subject that will be discussed in much greater detail in a later article.

When using table 8, it is necessary to first figure the cost of getting the lumber to the site of the work, unless you buy it delivered on the job.

Table 8. Centering for Hollow-Tile Arches

(Per 100 Sq. ft.)

	Segmental arches	Flat arches		
		Center hung	Side hung	Add for raised skewbacks
FBM timber	80	100	80	20
" plank	80	210	210	
" boards	145			
Hours laborers	5	5	4.5	0.5
" Carpenters	2.5			

The time given for laborers includes that taken for removing the forms after use. The time given for carpenters is that required for cutting out the arch-ribs and attaching the "lagging."

Gypsum Fireproofing

In general, the laying of pre-cast gypsum fireproofing, such as solid or hollow partitions, furring, etc., is an operation very similar to the laying of corresponding shapes of terra-cotta hollow tile, but the work will ordinarily proceed much more rapidly because the nature of the material, as well as its lighter weight, making practicable the use of much larger units. The partition tiles are usually made 12 x 30 inches, so that two and a half square feet of partition can be laid at one operation.

Another reason why faster work can be done with gypsum fireproofing is the much more regular shape of the units. Being cast, and not burned, gypsum

partitions are not subject to any shrinking or warping that will draw them from their intended shapes.

Because of the greater speed of laying, more scaffold room will be required to keep the same number of bricklayers busy than would be the case with hollow tile and an average of one scaffold builder for each mason is a fair basis for figuring.

The cost of handling gypsum partitions may be figured on the basis of the notes at the head of table 2 and by substituting the figures in column 3 of table 9 for those in column 1 of table 2.

The cost of laying and the amount of mortar required can be determined directly from the proper columns of table 9 but it should be remembered that either "patent plaster" or "prepared mortar" are used with gypsum partitions. Portland cement mortar will not properly bond gypsum construction.

Table 10 gives the quantities of materials needed to produce a cubic yard of mortar and the cost of mixing this mortar may be figured as explained in the discussion of Brickwork.

Table 9. Gypsum Partitions

(1) Size	(2) Weight per Sq. ft	(3) Labor hrs. loading or unloading per 100 sq. ft	(4) Mason hrs. laying 100 sq. ft.	(5) Cu. yds. mortar per 100 sq. ft.
2 x 12 x 30	7	0.50	3	.04
4 x 12 x 30	10	0.55	3.	.05
4 x 12 x 30	13	0.58	3.5	.07
6 x 12 x 30	17	0.65	4.5	.10
8 x 12 x 30	23	0.70	5.5	.14

The figures in column 5 are based upon an average thickness of joints of ½".

Table 10. Mortar for Gypsum Fireproofing

Proportions	Pounds patent mortar	Cu. yd. sand.
1:2	1300	0.94
1:2 1/2	1150	0.96
1:3	1000	1.00

Cast-in-place gypsum constructions, as well as long-span pre-cast gypsum constructions, are essentially the products of companies specializing in those lines. Those companies make a practice of taking contracts for the complete installation of their products so no discussion of their costs is necessary here.

Combination Hollow Tile and Concrete Floor Construction

Because of the number of different types of "systems" of combination hollow tile and concrete floor constructions is very great and because some of them are covered by patents, and can only be installed by licensees under such patents, no attempt will be made to make this paper cover every form of construction in general use. Only the "standard" types can be covered here but the same principals can be used for any other system when the details of it are known.

Such books as Concrete Engineer's Handbook, by Hool and Johnson (McGraw Hill Book Co.), Useful Data, published by Corrugated Bar Co., and the literature issued by National Fireproofing Co., and other manufacturers of hollow tile contain all of the information needed by the engineer who would determine the requisite thickness of the tiles, thickness of top-slab and amount of reinforcing steel.

In a previous article (Estimating the Cost of Tile Concrete in our July 25, 1922 issue) we have discussed the methods to be used in estimating the costs of the materials needed to make concrete of given proportions, as well as the cost of mixing that concrete and placing it under most of the conditions likely to be encountered in ordinary building construction. The same principles are to be used in estimating the cost of the concrete used in combination hollow tile and concrete construction and the quantity of concrete can readily be determined by reference to the specified requirements for thickness of tile and thickness of top-slab, if any.

Since tiles 12" wide, separated by a "rib" or "joist" 1" wide, is almost the universal type, it is evident that the joists are always 16" center to center and, therefore, each square foot of floor contains ¾ the amount of concrete in one linear foot of "joist," plus the amount of concrete in a square foot of top-slab. Thus, a construction of 6" tiles, with a 2" top-slab, will contain the following quantities in each 100 sq. ft. of floor.

75 6 x 12 x 12 tiles
75 lin. ft. 6" x 4" joists = 12.5 cu. ft.
top-slab (2" x 12" x 12")
x 100 = 16.7

29.2 cu. ft. = 1.08 cu. yd.

Table 11 gives the concrete quantities for a variety of constructions (the tile quantity is always 75 where the width of joists is 4" and the quantities for any other construction are determined by following the method given above). In the table an allowance of 5% has been made in the joists to provide for the additional concrete used at the ends of the rows of tile, over the supports.

Table 11. Cu. Yds. of Concrete Per 100 Sq. Ft. of Floor

Construction	Con. in Joists	Con. in Slab	Total
4 + 2	.49	.62	1.11
4 + 2½	.49	.78	1.27
5 + 2	.61	.62	1.23
6 + 2	.73	.62	1.35
8 + 2	.97	.62	1.59
8 + 2½	.97	.78	1.75
10 + 2	1.21	.62	1.83
10 + 2½	1.21	.78	1.99
10 + 3	1.21	.93	2.14
12 + 2	1.46	.62	2.08
12 + ½	1.46	.78	2.24
12 + 3	1.46	.93	2.39

The cost of getting the tiles into the building can be estimated from the information given in tables 1 and 2, using the columns headed "Partitions."

Placing the tiles on the forms, which can almost always be done by laborers, is an item that must not be overlooked and can be calculated from table 12.

Table 12. Placing Tiles on Forms

Thickness	Labor hours per 100 sq. ft.
4 inch	3
5 "	3
6 "	3.5
7 "	4
10 "	5
12 "	5.5

Reinforcing Steel

Because this form of construction is not ordinarily used for heavy live loads, it is not customary to use complicated reinforcement. The most common method is to use one or two bars in each rib, either or both of which may be bent up at supports. Where

the rods are carried across a support, care must be taken to figure in the necessary added length of rod and its weight.

The weight of the steel may be calculated by counting the number of rods, then multiplying them by their length and weight per foot or the method indicated in table 13.

Table 13. Reinforcing Rods

Nominal size	Weight per lin ft round bar	square bar	Pounds per 100 sq ft. One round bar per joist	One square bar per joist
½"	0.67	0.85	51	64
⅝"	1.05	1.35	79	102
¾"	1.52	1.91	114	143
⅞"	2.06	2.64	155	198
1 "	2.67	3.40	200	255
1⅛"	3.41	4.30	256	322
1¼"	4.20	5.35	315	403

Always add 5% to the computed quantity of steel, in order to take care of waste due to cutting, bending, etc.

Because stirrups, and similar members, are not regularly used in hollow tile and concrete constructions, the cost of forming and installing them will be fully covered in the next article, which takes up the entire subject of reinforced concrete work.

It is the custom to purchase the steel cut to scheduled lengths so the only costs that you would have at the site are bending and placing. This work can just as readily be done by any handy men, after a little training, but union regulations in many sections require reinforcing steel to be placed by structural steel erectors or metal-lathers.

Table 14 gives the production that may be expected from men of ordinary skill under good supervision.

Table 14. Reinforcing Steel

Bar sizes	Time in Labor Hours Bending per 100 eighth or quarter bends	Placing 100 bars Under 10 ft. long	10 to 20 ft. long	20 to 30 ft. long
½ inch or under	1.	4.50	5.75	7.
¾ and ⅞ inch	1.33	5.25	6.75	8.25
1 inch	1.67	6.25	8.	9.75
1¼ and 1⅜ inch	2.	7.50	9.75	11.50

Forms

For a "one-way" type of floor construction, open forms, similar to those used for ordinary hollow tile floor construction, except that supporting "shores" or posts will be required, will suffice. In fact, it is only necessary that the planks should be spaced so as to come under the "joists" or ribs and to extend a sufficient distance on either side to support the tile.

For a "two-way" construction, however, unless some form of "channel tiles" are used, it will be necessary to construct a solid floor of form work, as for a straight reinforced concrete slab. Except for the item of forms, the instruction given here for estimating "one-way" construction will apply for "two-way" construction, if proper allowance is made for the difference in quantities.

A good type of form construction consists of 2 x 8 planks, one under each "joist," resting on 4 x 6 joists, supported by 4 x 4 posts. There will also be the necessary amount of bracing and bolsters, and short planks or pedestals under the lower ends of the posts. Table 15 gives the necessary information for determining the number of joists and posts required, and 25% should be added to the quantities thus calculated in order to take care of the bracing, bolsters and pedestal. Salvage values are to be determined upon the same basis as that already outlined for centering for hollow tile construction.

Table 15. Form Joists and Posts

Construction	Spacing of joists in inches	Spacing of posts in inches
4 + 2	58	73
4 + 2½	58	72
5 + 2	56	66
5 + 2½	56	66
6 + 2	56	66
8 + 2	52	60
8 + 2½	52	60
10 + 2	50	54
10 + 2½	50	54
10 + 3	50	54
12 + 2	48	48
12 + 2½	48	48
12 + 3	48	48

Thus, to support a floor construction consisting of 10" tile and 4" x 10" concrete joists with 2½" top, over an area 25 x 100 feet, would necessitate the use of the following form lumber, the clear storey height being assumed as 12 feet:

Planks (25' length not being a stock length in most places, we must use a 14' and a 12' length) 2 x 8's, 75 pcs. of 12', 75 pcs. of 14' =	2600	fbm
Joists (25 feet divided by 50 inches plus 1 joist)=7 rows; 4 x 6, 35 pcs., 20' long	1400	"
Posts (7 rows of joists, 100 ft. long, 1 post each 54 inches, plus 1 post in each row) = 161 posts; 4 x 4, 161 pcs., 12' long	2576	"
Braces, etc. (25% of joists and posts)	944	"
	7520	"

which equals practically 3 fbm per sq. ft. of floor construction.

The total time required for handling this material, after delivery to the site, may be calculated from table 16. The time is given there in labor hours, to be divided by the estimator among carpenters and laborers as local conditions may require, but the work is not beyond the skill of good laborers.

Table 16. Labor on Forms

Assembling and erecting	15 hrs. per 1000 fbm
Stripping	6 " " " "
Re-erecting	11 " " " "

Course in Wood Construction

"Wood as a Building Material" is the title of a new short course of instruction announced by the U. S. Forest Products Laboratory for December 10 to 15 at Madison, Wisconsin. It is designed primarily for architects, construction engineers, and contractors and for others interested in the use of wood in building construction. It deals largely with the use of structural timbers from the standpoint of economy, safety and permanence. Full information and condtions of enrolment may be obtained from the director of the laboratory at Madison, Wis.

Water Resources Paper

The Water Power Branch of the Department of the Interior of Canada has issued Water Resources Paper No. 38, covering hydrometric investigations of the St. Lawrence and Southern Hudson Bay watersheds in the province of Ontario for the climatic year ending Sept. 30, 1922.

Ontario Highways Department Investigates

Checking of Concrete Road Surfaces

Field Observation and Laboratory Investigation Lead to the Conclusion that Absorbtive Bases, Rich Mixtures, and a Large Width-Depth Ratio Are Detrimental—Well Wetted Subgrades and Burlap Covers Offset Checking

By G. A. MACDONALD*
Assistant Testing Engineer, Ontario Department of Public Highways

During the past, in laying concrete road surfaces in certain localities, the concrete has persistently checked, although every precaution has been taken to prevent it. It was more or less prevalent during the summer of 1922 in certain contracts where the sub-grade was clay.

In order to determine the cause of such checking a pavement that was laid early in the autumn was selected for close observation. The concrete was laid on a brown clay sub-grade with stretches here and there that were inclined to be sandy. The contractor did not get started until well on in September, due to rain and bad weather. About two weeks later, in an endeavour to expedite the work, owing to the lateness of the season, the contractor put on an evening shift, running from 7.00 p.m. until 10.30 p.m. An examination of the previous day's work, one morning revealed a check about two feet in length in the section laid by the evening shift. This eliminated the sun as a factor in this particular check. Points where dry batches and sandy batches were placed were marked and observed for checking, with no results. The sand was suspected and material from another source tried, with no betterment. An occasional check only was showing up, many slabs having none. The contraction of the concrete was making itself manifest in another way—it was pulling away from the expansion joint material for an eighth of an inch or more.

No change was noted in the character of the sub-grade except that it was drying out and becoming dusty from the traffic of the light batch trucks which supplied the mixer. After every move the sub-grade was well watered before laying concrete and the finished work was covered with tarpaulins.

No Checks Evident After Sub-grade Wetted Down

The checking grew worse, until finally the contractor was asked to remove the loose-lying material upon the grade. This seemed to help somewhat. Two days of heavy rain stopped the work for a time and when operations were resumed it was observed that further checks occurred. The concrete was also bridging tight against the joints. In this connection it was noted that the contract was first started after a heavy rain and this apparently accounted for the non-appearance of checks early in the work.

The contractor was asked to keep the grade well wetted ahead of the work, and as a result only a very few checks occurred. With this information at hand and with the object of obtaining more complete data on the matter, an investigation of the problem was undertaken in the laboratory during the winter.

Small slabs were made, 18 inches square and 3 inches deep, of 1:1½:3 concrete, poured on clay bases. Base No. 1 was a saturated clay containing 26 per cent. moisture; base No. 2 was the natural clay as brought into the laboratory, with 14 per cent. moisture; and base No. 3 was clay that had been thoroughly dried, containing practically no moisture. The concrete slab on the dry base dried off quickly and was so firm in one hour and thirty minutes that it could no longer be trowelled. The slab on the base with 14 per cent. moisture took its set in two hours. The slab on the saturated base dried off very slowly and set in five hours. No checking occurred in any of these slabs, but on the dry base and the base containing 14 per cent. moisture, considerable contraction had taken place, as noted by the pulling away of the slab from the side-forms.

Mention will be made of slabs taking a set within a certain time. This may be defined as the time when the water has entirely disappeared from the surface and the mix has become sufficiently stiff so that further floating or trowelling brings no water to the surface, but leaves a smooth finish.

The ratio of depth to length of the above slabs was 1:6 and it was concluded that the cohesion of the concrete was sufficiently great to pull away from the side-forms before opening in the form of checks.

Quick Setting of Slabs on Dry Base

A second series of slabs were then made, ¾ inch in depth, the size, 18 inches by 18 inches, remaining the same, making a new ratio of 1:24. With this depth it was impossible to use the stone as before and a 1:3 mortar was substituted. Four slabs were made in this series: slab No. 1 poured on the saturated base with 26 per cent. moisture; slab No. 2 poured on a dry pulverized base; slab No. 3 on a combination base, a dry centre 8 inches square and the remainder of the area wet; slab No. 4 on a dry base as No. 2, but with a wetter mix.

Slab No. 1 on the saturated base acted much the same as in the previous series. It still took five hours to set. Changing the thickness did not seem to alter this feature. Slab No. 2 on the dry base took only 20 minutes to set, so that it could no longer be trowelled. Slab No. 3, on the combination base, took 30 minutes, the portion over the dry base setting up first, but it rapidly drew the moisture from the remaining part. Slab No. 4, wet mix on the dry base, took 20 minutes. The only difference the wet mix made was to produce an inferior mortar of low strength. In removing it from the form it broke up easily. The slabs poured on the dry bases still showed considerable contraction by moving away from the forms, and they set so quickly that it was impossible to finish them properly. Not only did the water dis-

*The foregoing is an abstract of "The Checking of Concrete Road Surfaces" appearing in the annual report of the department for the year 1922

appear but the cement as well was drawn down from the surface, leaving a rough finish. This feature serves to illustrate the quick setting many times observed on road construction, but most frequently blamed on the dry mix. Examination of the under side of the slab indicated that the different batches were failing to bond together properly at the bottom, due to their rapid setting on coming in contact with the dry clay.

Because the thin ¾-inch slabs on the dry clay were so difficult to finish, it was thought best to find the minimum depth that would finish properly and to increase the size of the slab to get the larger ratio. 1 : 1½ : 3 concrete was used in slabs 9 inches by 18 inches, of varying depths. Their setting times were as follows:

9" x 18" x 2" set in 40 minutes.
9" x 18" x 2½" set in 1 hour.
9" x 18" x 3" set in 1 hour and 20 minutes.
9" x 18" x 3½" set in 1 hour and 30 minutes.

The minimum depth that proved satisfactory for finishing was 3 inches.

The size of the slab was increased to 3 feet square with a depth of 3 inches. A 1 : 1½ : 3 concrete was used with a very coarse sand. One small check about 1½ inches in length occurred in this slab. A fine sand was used in the next slab in place of the coarse, but it failed to show any checks. Fig. 1 shows the mechanical analysis of the fine and coarse sand used in the above experiments and in the remainder of the tests.

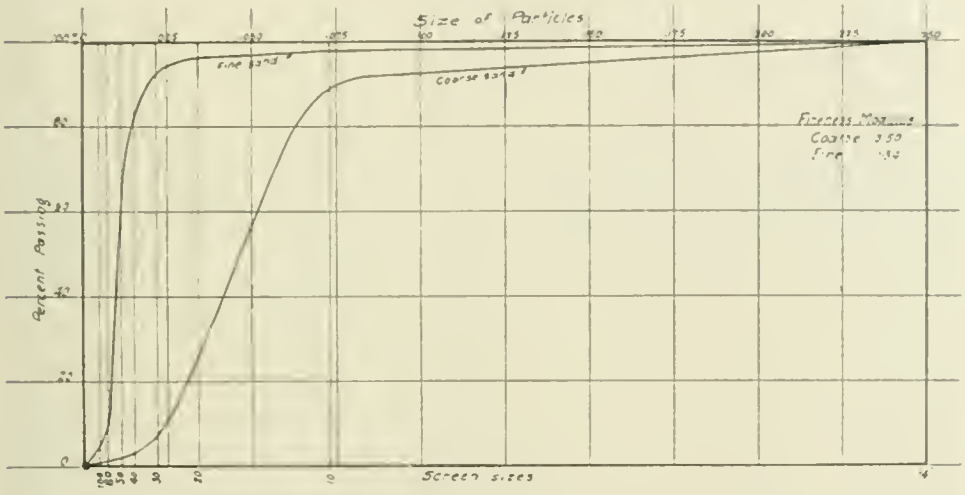


Fig. 1—Mechanical analysis of fine and coarse sands used in experiments

Relation of Type of Base to Contraction

At this point, due to the unsatisfactory results obtained so far, it was thought advisable to investigate the contraction of neat cement, having in mind the contraction cracks sometimes observed in the constancy of volume tests for cement.

Pats of neat cement were made about 6 inches in diameter, ½ inch thick in the centre and thinning out to a feather edge. These were placed on the following bases: glass, blotting paper, brick, porous concrete and plaster of paris. On glass no checking was noticed until after it was 24 hours old. On blotting paper it dried out quickly, merely curling the edges up and failing to check. On brick it dried out very quickly and formed several large checks. On porous concrete it set up somewhat more slowly than on brick and checked badly. On plaster of paris it dried off quickly and formed but very few checks.

These experiments showed that with the rapid loss of moisture considerable contraction occurred. This contraction took place in spite of the type of base, providing it had absorptive qualities. The checking was most severe on bases that had a high coefficient of roughness, such as brick and porous concrete. On the plaster of paris base, which was quite smooth, the neat cement moved easily from the edges toward the centre during the period of contraction. This was not the case with the brick and cement bases. The neat cement remained where it was placed and contraction manifested itself by the opening up of large and irregular cracks.

The above experiments also tended to show that two distinct forms of contraction took place. On the glass plate it did not take place until after the final set and the mass had become rigid. On the other hand the absorptive bases showed the contraction and checking taking place while the mass was in a plastic state. The first was undoubtedly due to evaporation and the second to absorption.

A series of neat cement pats were made up on the following bases: glass, brick, and porous concrete, and was placed in the moist closet. The pats on brick and porous concrete checked to the same extent as in the open air. The pat on the glass plate remained at constant volume and showed no checks.

In Fig. 2 are shown the pats of neat cement on glass; on the left cured in the moist closet and on the right air-dried, showing checks formed by evaporation.

The porous concrete base had proven to be the most satisfactory absorptive medium so far used where checking of the slab showed up as visible evidence of contraction. To standardize the results of further experiments, small forms were made 6 inches square and ½ inch deep, giving a ratio of depth to length of 1 : 12.

Three slabs were made up in these forms on porous concrete bases. Slab No. 1 was made of neat cement; slab No. 2 a 1 : 1 mortar using a coarse sand, and slab No. 3 a 1 : 1 mortar using fine sand. The neat cement slab checked badly; the coarse sand mortar showed one short check, and the fine sand mortar showed no checks.

New forms were made 8¼ inches square by ¾ inch deep, giving a ratio of length to depth of 1 : 22. The above experiment was repeated with neat cement, 1 : 1 mortar of coarse sand and 1 : 1 mortar of fine sand. The neat cement checked very badly, much greater than in any previous test. The coarse sand checked in several places, showing fine, wavy, hair-line cracks. The fine sand checked in one place only.

Two conclusions may be drawn from the above experiments. First, with the greater ratio of length to depth there is a correspondingly greater tendency to check. The 1 : 1 fine sand mix is richer than the 1 : 1 coarse mix because of the higher water ratio to volume of cement for the same consistency.

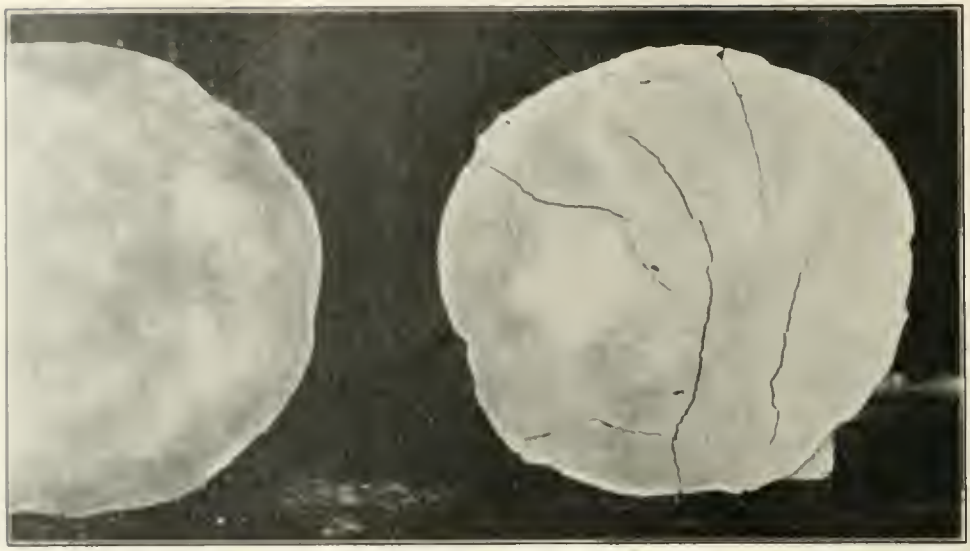


Fig. 2—Neat concrete slabs on glass base. Left, dried in moist closet; right, dried in open air

three variables of base, humidity and mix. Five were allowed to remain in the open air: slab No. 1, neat cement on glass plate; slab No. 2, neat cement on dry porous concrete; slab No. 3, neat cement on saturated concrete; slab No. 4, 1:1 coarse sand on dry porous base; slab No. 5, 1:1 coarse sand on saturated base.

The remaining forms were placed in the moist closet, viz.: slab No. 6, neat cement on dry base; slab No. 7, neat cement on saturated base; slab No. 8, 1:1 coarse sand on dry base; and slab No. 9, 1:1 coarse sand on saturated base. These slabs were all 8¼ inches square and ⅜ inch in depth.

Examining the slabs air-dried:—

Slab No. 1, neat cement on glass plate (Fig. 3), had no checks but slight contraction is noted from the right hand form.

Slab No. 2, neat cement on dry porous base (Fig. 4), checked very badly.

Slab No. 3, neat cement on saturated base, showed no checks and very little contraction from the sides. Fig. 5 illustrates the above two slabs, the only variable is the base, on the left dry and porous, and on the right saturated.

Slab No. 4, 1:1 coarse sand on dry base, checked slightly in six places. (Fig. 6, left.)

Slab No. 5, 1:1 coarse sand on saturated base, showed no checks. (Fig. 6, right.)

The slabs cured in the moist closet gave the following results:—

Slab No. 6, neat cement on dry, porous base, checked at many points with broad cracks and also pulled away considerably from the side-forms. (Fig. 7 left.)

Slab No. 7, neat cement on saturated base, showed no checks and had the typical dull appearance of moist cured concrete. (Fig. 7, right.)

Slab No. 8, 1:1 coarse sand on dry porous base, checked at twenty different points in fine hair-line cracks. (Fig. 8, left).

Effect of Humidity and Saturated Bases

Humidity was next investigated. Six slabs were made up of neat cement. Two were made on glass plates, two on moderately absorptive bases, water being dashed on the porous concrete, and two on highly porous bases. One of each pair was placed in the moist closet immediately after pouring and the other was left to air-dry. The neat cement pulled away slightly from the forms on the glass plate in the open air but showed no movement whatever in the moist closet. On the moderately absorptive base, no checks developed in the moist closet and three showed up in the open air. On the porous bases both slabs were badly checked. High humidity may have some effect in retarding checking on moderately absorptive bases, although the result was not very conclusive. On highly absorptive bases it apparently had no effect.

Experiments were next carried out to find the effect of using saturated bases. The same bases were used as for the previous tests, those requiring to be saturated were placed in water over night. Nine slabs in all were made in this series, introducing the

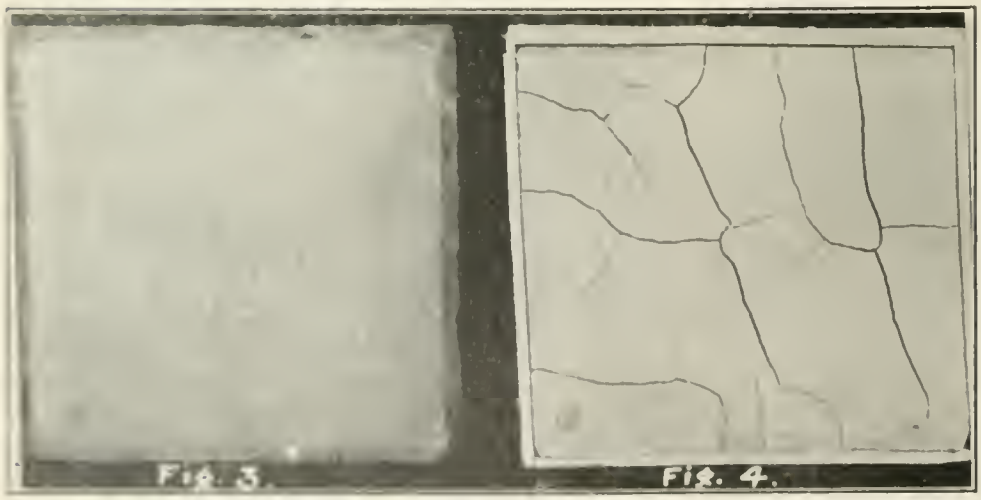


Fig. 4—Neat concrete slab on dry porous base, air dried, showing bad checking

Slab No. 9, 1–1 coarse sand on saturated base, showed no evidence of contraction. (Fig. 8, right).

Slabs No. 7 and No. 9 may be said to have been cured under ideal conditions—no absorption or evaporation except while finishing could take place, and during their whole period of setting and acquiring strength they remained at constant volume and were under no contraction stress.

A study was undertaken to find the percentage of water lost by absorption and that lost by evaporation. Two slabs were made up of neat cement, 4½ inches square and ⅜ inch deep. These were placed on plaster-of-paris bases, one of which had been previously placed in water over night, and the other

The slab on the saturated base was placed in the moist closet after it had set sufficiently to finish. While finishing 10 per cent was lost by evaporation. After one week in the moist closet it was removed from the forms and allowed to dry out in the open air, with the following result

Time		
0 hour		
5 hours		
24 hours		
2 days		
1 week		
2 weeks		
3 weeks		

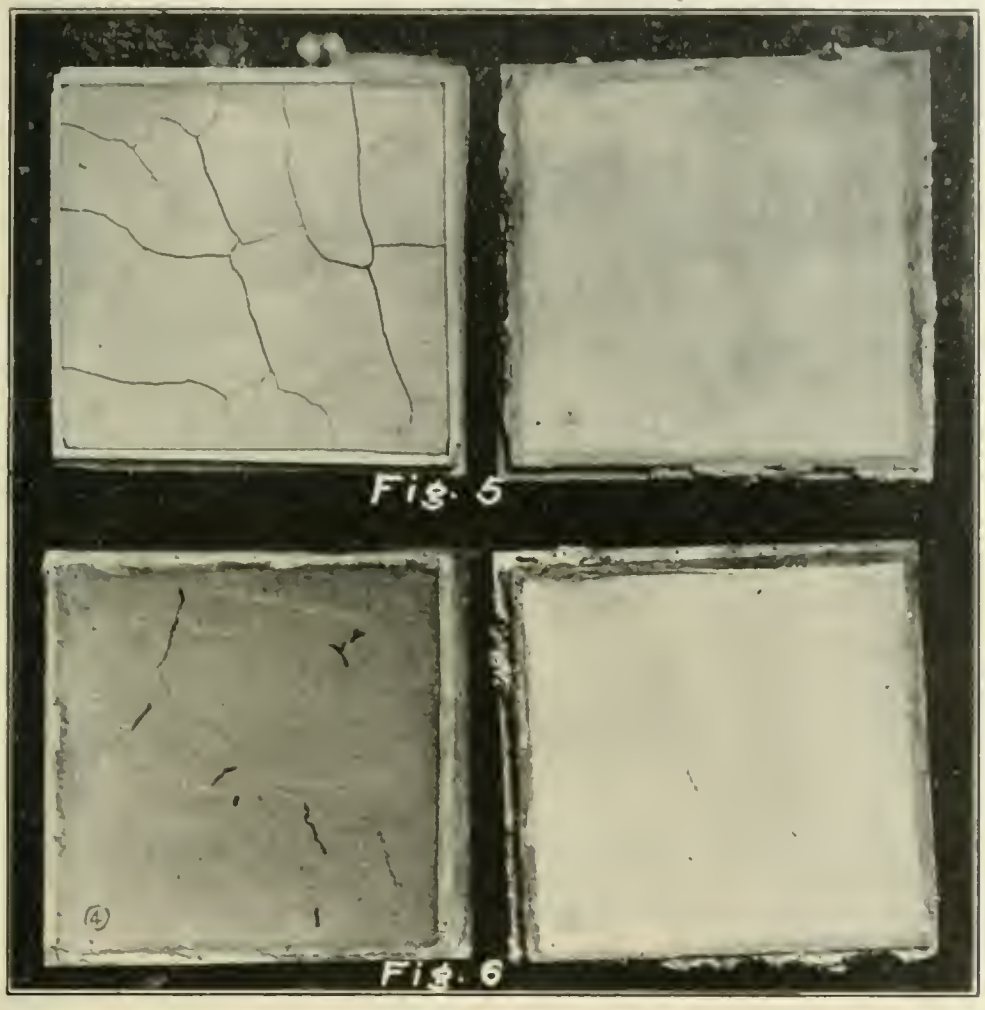


Fig. 5—Neat cement slabs dried in air; left, on dry porous base; right, on saturated porous base.
Fig. 6—Sand-mortar slabs air dried; left, on dry porous base; right, on saturated porous base

dried in the open air.

The slab on the dry absorptive base dried off quickly and set up so that it could easily be removed from the forms at the end of an hour. The increase in the weight of the plaster-of-paris base and of the side forms was carefully noted and also the loss in weight of the cement slab at different intervals with the following results:—

Time	Percentage of original water content lost By absorption in base and forms	By evaporation	Total
0 hour	0%	0%	0%
1 hour	47	4	51
7 hours		17	64
24 hours		31	78
2 days		34	81
1 week		35	82
2 weeks		37	84
3 weeks		35	82

0'	0	0
	10	10
	12	12
	14	14
	16	19
	28	28
	30	30

The outstanding facts from these tests was the loss of 47 per cent. by absorption within an hour by the dry base, and 31 per cent. by evaporation within the first twenty-four hours of the air-dried specimen, leaving but 22 per cent of the original water content for the process of hardening.

With the saturated base and the moist closet curing the water content was so conserved at the end of three weeks that 70 per cent. of the original amount had been used or was available for use in the chemical action of setting. This contrasts with 18 per cent. available at the same age in the previous test.

The results of the above tests are shown graphically in Fig. 9.

Tests With Dry Clay

Attention was focused on the clay used in the previous experiments as an absorptive base. It was desired to obtain the rate of absorption and the amount: 250 c.c. of dry pulverized clay were placed in a 500 c.c. graduate and carefully covered with water to the 500 c.c. mark. Readings were taken every ten minutes of the water level in the container and the depth to which the moisture line had descended. The results are indicated by the curves in Fig. 10. Note the almost constant rate of absorption as shown by the number of inches of water required. After the moisture line had reached the bottom of the container, additional water was still required for saturation.

This condition is probably a parallel with the wetting down of a dusty sub-grade before pouring concrete. The thickness of an inch or less wet layer merely acts as a vehicle for the further absorption of moisture from the concrete placed above it.

In further tests of slabs on dry clay those made from neat cement checked. On tests of mortar slabs the high absorption was still evident with its resulting contraction, but the base had very little restraining effect upon the movement of the slab. The slab was thus permitted to contract without the forma-

Fig. 7—Neat concrete slabs cured in moist closet; left, on dry porous base; right, on saturated porous base
Fig. 8—1:1 sand-mortar slabs cured in moist closet; left, on dry porous base; right, on saturated porous base

Summary of Results

To summarize the results:—

(1) Checking is the result of contraction caused by the loss of moisture from any cause when the concrete (cement or mortar) does not possess the required strength to overcome the outside restraining forces.

(2) An absorptive base hastens the time of setting of concrete and cement mortars—the greater the absorption the shorter the time of set.

(3) An absorptive base tends to draw the cement and fine material away from the surface, leaving the larger aggregate above the general contour of finish.

(4) An absorptive base does not permit the batches to bond together properly, due to their stiffening on coming in contact with an absorptive medium.

(5) The tendency for slabs to check increases with the increase in the ratio of length or width to depth. A 20 ft. pavement would check to a greater extent than an 18-ft. pavement if the thickness remained the same.

(6) The richer the mix is in cement the greater the contraction, with an increased tendency to check.

(7) Extra wet mixes may help to prevent checking on moderately absorptive bases, but the resulting concrete is of low strength.

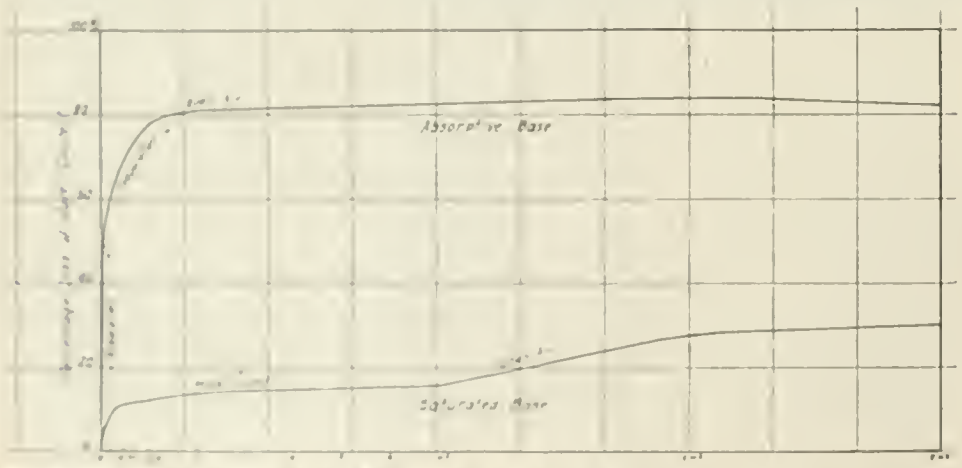
(8) With no loss of moisture the concrete tends to remain at constant volume.

(9) A saturated base prevents all losses by absorption and may even supply moisture to the slab to replace losses by evaporation.

Practical Suggestions

In making the results of practical application in road work, it is suggested that the procedure be somewhat as follows:—

On completion of a day's work the grade should be watered in preparation for the next day's work. Enough water should be placed on it and at such intervals so that it will not lie in pools or make the grade mucky. When the laying of concrete is commenced the area in front of the mixer should be well watered. This should bring about a condition close to saturation that would materially cut the losses by absorption. If the concrete materials



Diagrammatic representation of the effect of a dry porous base as compared with a saturated base, on a moisture content in neat cement mortars

are placed on the grade in front of the mixer it will be more difficult to follow the above procedure.

For the prevention of evaporation losses, dry covers such as tarpaulins laid directly on the concrete tend to aggravate the condition by absorbing additional moisture. Covers on frames may prevent the sun from increasing the temperature, but they will not stop evaporation. It is suggested that burlap strips be used, as has been done in some cases. They are 3 feet in width, of double weight material and overlap each other. They are not as costly as tarpaulins and the actual cost of handling them is much less than moving heavy frames. They should be kept soaked with water and placed in that condition on the concrete when it has obtained a set, so that they will not mar it. These should be kept in a moist condition and not removed until just prior to covering the pavement with earth. If this procedure is followed a more uniform curing condition will result and at a time when the concrete is in greatest need of it.

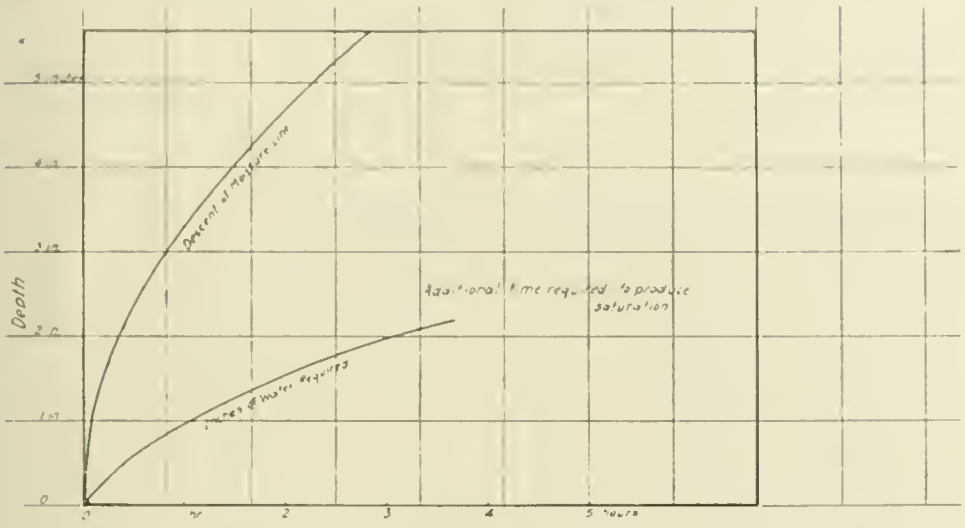


Fig. 10—Graphic representation of the absorption of water by dry pulverized clay used as basis for specimens in experiments

Some Details in Street Design

Large Aggregate in Asphalt Paving Increases Wearing Qualities—A Rough Base Course is an Advantage

In a paper recently submitted before the American Society for Municipal Improvements, P. L. Brockway, Wichita, Kan., U.S.A., outlined some very practical suggestions regarding street design. Some extracts from his paper follow:

Some engineers have thought that it should be possible to retain the very excellent qualities of the standard sheet asphalt wearing surface, and yet increase its resistance to internal flow, by adding larger, angular aggregate up to material passing a $\frac{3}{8}$-in. screen without any other modification of the mixture. A surface was constructed along these lines four years ago, on a brick surface which had been practically destroyed by the concentrated heavy traffic leading to two ice and cold storage plants, a large planing mill and a freight depot. Asphaltic cement having penetration of about 45 was used There was used about half as much material over the $\frac{1}{4}$-in. and through the $\frac{3}{4}$-in. screen as would ordinarily be specified in the fine aggregate asphaltic concrete mixture. Street temperatures during [illegible] about 0 to 125 deg. F. have been observed with standardized thermometers many times, the maximum being 137 deg.

Traffic counts indicate an average of [illegible] tons daily or about 200 tons per foot width. In addition, heavy reconstruction of some of the plants has caused some very heavy loads of machinery to pass over it and heavy, vibrating construction machinery to stand in one place for weeks at a time. The pavement marks up some in extreme hot weather but has not yet developed any waves or general unevenness of surface. The same mixture has since been used on several other of our heavier traffic business streets having traffic counts up to 10,000 vehicles per day and only one serious wave was developed.

Another point in the construction of soft top pavement which is more important than formerly is the degree of roughness of the base course on which the surface is laid. Many old pavements which were laid with rock aggregate so coarse that it was practically impossible to get an even contour, to say nothing of a smooth surface, are holding their own pretty well even under the punishment of greatly increased traffic. Other base laid with greater care in later years, and especially base laid without coarse aggregate having fairly smooth surface texture, has not fared so well. Examination shows that spots which give the greatest trouble from shoving of the wearing surface are above unusually smooth places on the concrete base. There was, therefore, developed a plan of artificially roughening the surface by marking across the base at intervals of about 18 in. by striking it with an inch rope when the concrete is still soft enough to be readily cut by the rough rope. The marks are made about $\frac{1}{2}$-in. deep. This method has not been in use long enough to prove its merit but there is no question that roughening of some kind will be an advantage.

Another detail in pavement design which has proven very successful in the use of creosoted wood of 2-in. commercial thickness set with the grain vertical in transverse contraction or expansion joints in concrete pavement. Such joints have been in use twelve years without a single failure, without costing anything for maintenance and without the objectionable lump which so often develops.

In the biographical sketch of Mr. A. L. Harkness, which appeared in the "Canada's Engineers" series of Contract Record of October 31, page 1026, it was stated that he had been engaged in placing orders and supervising shipments of materials in connection with a large power house for the Shanghai Municipal Council, and also that he checked the reinforced concrete design and supervised the construction of the Drummond Court apartments, Montreal. Inadvertently the name of the Dominion Engineering & Inspection Company was not given as the employer of Mr. Harkness' services in these connections.

Construction Developments During the Month of November

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Eastern Canada, November, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value.	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	1	$ 14,000	4	$ 285,000	..	$	....	.....	5	$ 299,000
Churches	7	176,000	3	57,500	1	30,000	3	23,000	14	286,500
Factories	12	336,900	4	41,000	..	.....	2	16,000	18	393,900
Public Garages	6	64,500	6	345,500	1	6,000	3	6,700	16	422,700
Hospitals	....	.....	1	4,000	..	.....	....	.....	1	4,000
Hotels and Clubs	10	121,200	5	74,200	....	.....	2	10,500	17	205,900
Office Buildings	9	158,500	2	10,500	..	.....	....	.....	11	169,000
Public Buildings	8	61,000	2	40,400	1	29,800	2	13,400	13	144,600
Residences	800	3,420,500	406	2,376,400	1	4,000	11	62,700	1220	5,871,700
Schools	7	247,400	3	108,700	....	.....	1	6,000	11	362,100
Stores	33	283,000	5	38,500	1	50,000	1	7,500	40	379,000
Theatres	3	16,000	..	.....	....	.....	....	.....	3	16,000
Warehouses	7	98,200	3	63,500	..	.....	1	8,000	11	169,700
Total Buildings	903	$4,997,200	444	$3,445,200	5	$119,800	25	$153,800	1380	$8,724,100
Bridges	3	5,200	6	93,600	....	.....	2	20,000	11	118,800
Dams and Wharves	6	580,900	7	52,500	....	.....	3	18,600	17	560,400
Sewers & Watermains	15	169,500	2	19,000	....	.....	3	6,400	20	194,900
Roads and Streets	34	1,167,500	6	425,000	....	.....	....	.....	40	1,592,600
General Engineering	7	436,700	3	2,090,000	2	118,400	2	34,400	14	2,679,500
Grand Total	968	$7,357,100	468	$6,125,300	7	$238,200	36	$233,200	1482	$13,970,300

Construction Contracts Awarded in Western Canada, November, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western Total	
	No.	Value.	No.	Value	No.	Value	No.	Value	No.	Value
Churches	1	$ 3,500	..	$	1	$ 1,500	..	$	2	$ 5,000
Factories	4	312,500	1	10,000	1	2,000	1	15,000	7	339,500
Public Garages	1	4,100	..	.....	..	.....	..	.....	1	4,100
Hospitals	....	.....	....	.....	1	2,000	....	.....	1	2,000
Hotels and Clubs	2	12,000	2	26,000	2	7,000	....	.....	6	45,000
Office Buildings	1	2,500	..	.....	..	.....	3	32,400	4	34,900
Public Buildings	4	491,100	..	.....	..	.....	....	.....	4	491,100
Residences	69	271,100	22	70,700	24	83,400	27	96,800	142	522,000
Schools	1	5,000	1	1,200	3	16,400	....	.....	5	22,600
Stores	5	18,000	..	.....	1	8,000	1	5,000	7	31,000
Theatres	....	.....	....	.....	....	.....	2	9,000	2	9,000
Warehouses	3	23,000	1	1,700	1	6,000	..	.....	5	30,700
Total Buildings	91	$1,142,800	27	$109,600	34	$126,300	34	$158,200	186	$1,536,900
Bridges	1	6,500	....	.....	..	.....	..	.....	1	6,500
Dams and Wharves	2	15,200	1	15,000	..	.....	..	.....	3	30,200
Sewers & Watermains	....	.....	1	5,300	..	.....	..	.....	1	5,300
Roads and Streets	....	.....	....	.....	..	.....	2	35,000	2	35,000
General Engineering	1	1,500	....	.....	1	43,500	....	.....	2	48,000
Grand Total	95	$1,169,000	29	$129,900	35	$169,800	36	$193,200	195	$1,661,900

The Importance of Filter Sand and Gravel in Filtration Plants

On the Quality of the Purifying Media in Slow and Rapid Sand Filters Depends the Success of the Purification—Washing Controls Efficiency of the Plant

By A. O. TRUE

Before the North Carolina section of the American Water Works Association

It is probably impossible to state where or at what epoch sand was first utilized by man as a medium for purifying drinking water. Its use was known to the ancients, who undoubtedly observed, at an early date, the effective clarification of ground waters in their natural transit through sandy and gravelly substrata. It is a well known fact that the North American Indians had a regard for pure water. When necessity compelled, they would obtain water from shallow holes scooped in water-bearing sand, rather than draw their supply from a more accessible but muddy stream. The history of the use of sand, as a water purifying medium, is practically the history of water filtration, for the reason that while many other water filtering media have and are being used, such as coke, charcoal, porous plates and tiles, synthetic silicon dioxide and zeolites, their use has been relatively limited and usually for special purposes. The extensive practical accomplishments in water filtration have been obtained, over a period of nearly a century, by the employment of sand and gravel filtering materials. But it is not the purpose in this paper, to trace the history of water filtration, but to call attention to some of the more common physical properties of sand and gravel, and their relation to present methods in modern municipal water filtration practice.

Development of Sand Filtration

A few facts in relation to the development of water filtration will be sufficient to indicate the importance of the use of sand as a filtering medium.

The first water filter for the purification of a public water supply on a relatively large scale, appears to have been a filter constructed in East Chelsea, London, England, in 1829. It employed sand as the filtering medium. It was also the forerunner of the so-called slow sand water filter, many of which were put in operation in succeeding years in Europe, and were introduced into the United States about 48 years later.

The reduction in epidemic water-borne diseases, in those cities which pass their polluted river water supplies through a bed of sand, was so remarkable that this type of purification grew rapidly.

In 1885, however, the rapid or American type of sand filter for municipal water purification, made its appearance and was destined to have a wonderful growth, until today, probably three times as many people are supplied with water from rapid sand filters as from slow sand filters including the modified slow sand types.

It is unnecessary to inquire or discuss at length why this is so. The rapid sand method has been found more applicable and economical than any other in the purification of many of our surface water supplies particularly those waters which sometimes carry large amounts of fine suspended particles.

The significant fact is, in relation to this subject, that, throughout the history of water purification sand has been, and is, the accepted medium depended upon for freeing water from dangerous and objectionable impurities.

Valuable Qualities of Sand

The writer believes it has been demonstrated that natural quartz sand of the proper size, uniformity and purity is the most efficient filtering medium obtainable for water purification purposes. Among its desirable physical qualities for this purpose, the most important is indestructibility. It is practically unaffected by the elements and to no large extent by the physical conditions encountered in a filter. Water has no considerable solvent action on sand, nor is sand subject to any depreciation with the possible exception of a slight amount of abrasion from the contact of grains in the process of washing.

Perhaps next to permanency, the most valuable quality of sand as a filtering medium is its high specific gravity. This is an especially desirable and necessary quality in the modern type of rapid filter in which the filtering material must resist by gravity the rapid upward flow of wash water if it is to remain in the filter. The greater weight and resistance of the filtering material, as compared to the smaller dirt particles, constitutes the principle whereby it is possible to separate the sand from the impurities removed in filtration, and to discharge them quickly into the sewer. A relatively pure quartz sand has a specific gravity of about 2.6. The differential resistance of the sand grains and dirt particles, by virtue of their size and specific gravity will be mentioned again in connection with the conditons in a rapid filter when being washed.

Finally, sand is undoubtedly the cheapest of all materials which may be satisfactorily used as a filter material. There are many natural deposits of sand, suitable for filter purposes. These are fairly well distributed as to make natural filter sand available to our centres of population without excessively long hauls.

The three desirable characteristics of sand, and also gravel, as filtering media, namely, permanence, freedom from depreciation, high specific gravity, and availability at low cost, are readily appreciated by all charged with the design and operation of filter plants.

Troubles With Sand

Sand is not a perfect filter medium in rapid filtration, as at present practiced. Some troubles are reported from the majority of filter plants, which indicate that filter sand has some qualities which render the process less efficient than would otherwise be the case. Whether these difficulties may be attributed to inherent qualities of the sand as distinguished from other filtering media, and if so, to what extent, are questions which cannot be answered conclusively at

[illegible] referred to are the tendency to vertical stratification of the sand after washing, the formation of the so-called 'mud balls' in the upper portions of the sand bed, and the recently reported under-water shrinkage of sand beds.

[illegible] seems to be that the sand bed and sand loss encountered is attributable not to the wash itself, but to inefficiency of coagulation and the failure of the wash water system to expel and carry away the impurities from the sand surface by the wash water. The shrinkage, under water, of sand beds in rapid sand filters has been reported, as far as I can learn, in only a very few instances. Some observers report the actual drawing away of the sand bed from the supporting walls of the filter to the extent of a fraction of an inch, and for a considerable depth, with the result that imperfectly filtered water reached the under drains of the filter. Studies in the chemistry and physics of colloids seem to show that many granular substances in the presence of water are subject to an internal force affecting the intergranular spaces and causing a shrinkage of the substance. Clay is a good example of such a substance, and some sands appear to possess this quality. Observation of sand beds with reference to under-water shrinkage and the best means to prevent or overcome it will be extremely important if it is shown that this phenomenon is of frequent occurrence.

Importance of Filter Washing

Probably the two most important operations in rapid sand filtration are coagulation and filter washing. They are also the most difficult to control to get best results.

It is an axiom of rapid sand filter operation that filter materials efficiently washed and graded will filter evenly and efficiently and vice versa.

The conditions in a filter, when washed by vertical reverse currents, are familiar to operators. The whole sand bed assumes a semi-fluid, non-resistant condition, due to the dispersion of the sand grains in the wash water stream. A test rod dropped into a filter being washed sinks readily and stops only on reaching the undisturbed supporting gravel at the filter bottom. The dirt accumulated by the filter, together with the coagulant making up the dirt layer on the sand surface, is broken up and dispersed by the upward stream. These dirt particles, being for the most part lighter than the sand grains, are carried upward and beyond the sand, then laterally into the wash troughs and sewer. The smallest sand grains however, under a vertical velocity of water not to exceed 24 inches per minute will rise only about 18 inches, and should not reach the wash trough.

[illegible] is out of rejection of the dirt and retention of the sand by virtue of the selective action of the wash water stream. Two important physical conditions make this separation possible. First, the fact that the dirt is for the most part lighter than the sand, and second because the dirt particles are smaller than the sand grains and therefore offer less resistance to the rising current.

[illegible] weight of a particle increases approximately as the cube of its diameter, while its projected area, and consequent resistance to a stream of water, increases only as the square of its diameter, the finer sand grains are carried higher in the upward wash water stream, to points where the latter decreases in velocity. If this is true, it is reasonable to conclude that very fine particles of dirt, or foreign matter, which are as heavy as the filter sand, are carried into the sewer by the ordinary rates of rapid wash.

As the wash water is shut off from a filter unit, the suspended sand bed immediately begins to settle down to its natural position on the supporting gravel in the filter bottom. As this occurs, the law just mentioned with reference to weight and surface resistance again comes into play and tends to cause the largest sand grains to settle most quickly. The result is that, in the absence of distributing currents, the sand bed stratifies in horizontal layers increasing in fineness of sand grains from the bottom to the sand surface. This places the coarsest sand at the bottom and the finer grains at the top. A bed in this condition offers equal resistance to the flow of the water in the filtering direction and yields the most efficient filtration. The slow closing of wash water values probably aids in permitting this horizontal stratification of the sand.

Sand is a highly porous material, and a large percentage of the volume forming a sand bed is, of course, space between the grains. In dry sand these spaces or voids amount to from 30 to 40 per cent of the cubical volume.

Air in the Filter Bed

If for any reason a filter is drained, the voids in the sand bed become wholly or partially filled with air. It is well known that a filter will operate most satisfactorily when these voids are completely filled with water, and that air in the filter bed is troublesome, and in sufficient quantity will completely stop the flow of water through the sand. Another source of air lodging in the intergranular spaces is the water passing through the filter. Under certain conditions of temperature and lowering of pressure, this air separates from the water. In some plants this occurs with sufficient frequency to constitute an annoying feature of operation. The only remedy seems to be careful displacement of the air by a reverse current of water. This raises and fractures the dirt layer and undoubtedly disturbs the efficiency of the filter unless the unit is washed before being again placed in operation.

The sand bed in a modern rapid sand filter is from 24 to 30 inches in depth. Best results seem to be obtained with sands of effective sizes from 0.35 mm. to 0.45 mm. The uniformity coefficient should be not far from 1.6. If the units are arranged for rapid wash the sand surface should be at least 20 inches below the lip of the wash water troughs.

The coarse-grained layer supporting the filter sand is usually referred to as the gravel. There seems to be no set rule as to the diameter below which stone particles are termed sand and above which they are termed gravel. Generally speaking, material 1/8 inch in diameter and smaller is classified as sand and larger diameters gravel.

In the older air and mechanical wash type of rapid filters the gravel layers are 8 to 12 inches in depth. In the newer rapid water wash type, the gravel bed is about 18 inches in depth. It is usually graded in several horizontal layers from coarsest at the bottom next to, or surrounding, the strainer system to the finest at the top and directly under the sand bed. These layers average some 3 1/2 inches in thickness, the bottom stones being 2 to 2 1/2 inches in diameter

and the top layer of gravel being about 1/10 inch in diameter or smaller.

Reason for Thick Bed of Gravel

The purpose of this thick bed of graded gravel is three-fold. First, to furnish a support for the filter sand, which will prevent the latter from being washed into the strainers. Second, to allow the clear water to pass freely and uniformly from the filter to the underdrainage system when filtering. Third, and most important, to distribute the wash water across the entire horizontal section of the filter and to deliver it evenly and without eddies to the sand bed. Eighteen inches of gravel of the sizes mentioned above have been found sufficient to resist the upwards force of the wash water when applied at a rate of 15 gallons per square foot per minute, without danger of "blow-ups" or the breaking through of the gravel and a consequent intermixing of the gravel and sand. It would appear that higher velocities of wash water than 15 gallons per minute, equivalent to 24 inches vertical rise per minute, would seldom if ever be necessary. Higher velocities would probably require special arrangements in filter design to prevent loss of sand into the wash troughs. It is questionable if wash water rates higher than 24 inches per minute would be economical.

Every operator should appreciate the necessity of uniform and thorough washing of the sand bed of rapid filter units. As already stated the efficiency of filtration depends upon this. The gravel bed plays an important role in securing uniform washing and the consequent settling of the filtering materials in uniformly graded horizontal layers. To obtain these results it is important that the gravel layers be carefully laid, that uniform sizes of stones be secured and level layers of uniform thickness for each size. Only in this way can such a bed be laid as to offer equal resistance to the rising wash water at all points over the horizontal area of the filter bottom.

How Should Lime Plaster Be Applied?

Standard Specifications Covering Two and Three Coat Plaster on Wood and Metal Lath

"Standard Specifications for Lime Plaster" is the title of a bulletin just issued by the National Lime Association. This bulletin is the result of several years study of field conditions and has been prepared in conjunction with representatives of the engineering and architectural professions as well as expert plasterers and producers of lime.

The specifications are in such form that they may be quoted directly and included in an architect's complete building specifications, or, if desired, the short form, also included, may be used and the contractor referred to the standard specifications.

The standard specifications are as follows:

General

1. The contractor shall furnish all necessary tools, scaffolds and other appliances needed to fulfill the requirements of this contract, all scaffolding to be erected and maintained in accordance with the laws of the state, province or municipality having jurisdiction.

2. All interior walls and ceilings where other finish is not required shall be plastered (two coats, three coats) unless otherwise specified (here describe extent of work.)

3. Plastering may be omitted back of marble, slate or soapstone wainscots that are backed up with concrete or masonry.

4. Stud partitions back of marble, tile, slate or soapstone wainscots shall be lathed and plastered one coat, (except where spaces are filled with brick or terra cotta).

5. The finish coat of plaster may be omitted from plastering behind wood wainscots or baseboards.

6. All putty made from quicklime and used for scratch or brown coat work shall be allowed to age without drying out for at least three (3) days, or if sand is added, the mortar shall be stacked at least three (3) days before use.

7. The use of open salamanders is forbidden.

Materials

8. Quicklime for plastering shall be of first quality, fresh and properly burned, and shall be such as to satisfy the current specifications of the American Society for Testing Materials, as well as the local, state, province or national laws.

9. Hydrated lime shall be of such quality as to satisfy the current specifications of the American Society for Testing Materials.

10. Sand shall be clean and of angular grains and shall be well graded. It shall all pass through a number eight (8) sieve. It shall be free from loam, clay, etc., in excess of ten (10) per cent, by volume, and shall be entirely free from vegetable or animal matter.

11. Hair shall be clean, long, goat or cattle hair, free from grease and shall be well beaten and soaked before incorporating. Vegetable fibre at least two (2) inches long may be substituted for hair.

12. Clean, fresh water only shall be used.

13. Wood lath shall be of No. 1 quality and of such length that joints will be made on studs or furring strips.

14. All metal or wire lath shall be (enameled, painted, dipped, galvanized).

15. The minimum weight of metal lath used shall be

	Without Ribs	With Ribs
On walls	2.2 lbs. per sq. yd.	2.50 lbs. per sq. yd
On ceilings	3.0 lbs. per sq. yd.	3.00 lbs. per sq. yd.

Application and Workmanship

16. All wood lath shall be nailed to each stud, beam or furring strip with 3d 16-gauge wire nails driven flush. Joints in lathing shall be broken at least every eighth course. Lath on walls shall be laid horizontally, and on ceilings shall be run in one direction only. A full three-eighths (3/8) inch key shall be provided between lath.

17. Metal lath, wire cloth or other metallic lathing shall be stretched on application and securely stapled or attached to all studs or furring strips so as to provide a rigid base for the plaster. All vertical joints shall be made on supports. Metal lath shall be securely tied with annealed wire at least once between supports along horizontal joints. Laps shall

[illegible] the instructions of the [illegible]

[illegible] before plaster [illegible] shall be well wetted just prior to the application of the plaster. No free film of water on the surface, [illegible] along the edge of the lath shall be present when the plaster is applied.

Two-Coat Lime Plaster on Wood Lath (Doubled-Up Work)

[illegible] shall be a mixture of lime paste or putty, prepared from properly slaked quicklime which has been allowed to age either neat or sanded for at least three (3) days, or hydrated lime, with sand, etc., in the following proportions:

Proportions for Two Coat Doubled-Up Lime Plaster on Wood Lath

First Coat	Brown Coat
Stiff lime putty	Stiff lime putty
Plastering sand	Plastering sand
1 part by volume	1 part by volume
1 part by volume	3 parts by volume
2 parts by volume	
[illegible] per cu. yd. of sand	

Finish Coat

For various finish coat proportions, see section 49.

20. Plastering shall be five-eighths (5/8) inch grounds.

21. Apply a coat of first coat mortar with sufficient pressure to make a good key at the back of the lath, then bring out to grounds by doubling up on this coat. Use rod and darby to bring to a true, even surface ready for the finish coat. When this coat is dry apply the finish coat.

22. For finish coat specifications, see section 49.

Two-Coat Lime Plaster on Brick, Tile, Gypsum Block, Etc. (Doubled-Up Work).

23. The mortar shall be a mixture of lime paste or putty prepared from properly slaked quicklime which has been allowed to age either neat or sanded for at least (3) days, or hydrated lime, with sand, etc., in the following proportions:

Proportions for Two-Coat Doubled-Up Lime Plaster on Brick, Tile, Gypsum Block, Etc.

Bond Coat	Brown Coat
Stiff lime putty	Stiff lime putty
Plastering sand	Plastering sand
1 part by volume	1 part by volume
2 parts by volume	3 parts by volume

Finish Coat

For various finish coat proportions see section 49.

24. Plastering shall be to five-eighths (5/8) inch grounds.

25. Mortar joints in walls to be plastered shall be cut flush. (Include in specification for brick work.)

26. (a) The surface of the wall shall be swept free and shall be free from oil, grease or soot.

(b) All masonry surfaces shall be well wet before plastering but there shall not be a surface film of free water present when plastering begins.

27. Apply a one-quarter (1/4) inch coat of mortar with sufficient pressure to secure a good bond to the masonry, then bring out to grounds by doubling up on this coat. Use rod, darby and float to bring to a true, even surface ready for the finish coat. When plaster is dry, apply the finish coat.

27. For finish coat specifications, see section 49.

Two-Coat Lime Plaster on Concrete

28. The mortar shall be a mixture of lime paste or putty, prepared from properly slaked quicklime which has been allowed to age either neat or sanded for at least three (3) days, or hydrated lime, with sand, etc., in the following proportions:

Proportions for Two-Coat Doubled-Up Plaster on Concrete

Bond Coat	Brown Coat
Stiff lime putty	Stiff lime putty
Plastering sand	Plastering sand
1 part by volume	1 part by volume
2½ parts by volume	3 parts by volume

Finish Coat

For various finish coat proportions, see section 49.

29. Plastering shall be to five-eighths (5/8) inch grounds.

Note. Concrete surfaces to be plastered shall be cast in rough forms so as to provide as good a bond as possible for the plaster. (Include in specifications for concrete work.)

30. If the concrete surface is smooth or glazed or out of wind it shall be hacked or roughened so as to provide a suitable mechanical bond, or 10% by volume of portland cement shall be added to the bond coat mix. Just before plastering, the surface shall be wire brushed and swept clean, and shall be free from oil, grease or soot. The concrete shall be practically dry, but if bone dry shall be moistened with a brush, shortly before plastering starts. No mortar shall be applied to wet or frozen concrete.

31. (a) Apply a one quarter (1/4) inch coat of soft mortar with sufficient pressure to secure a good bond to the concrete. Before this coat has hardened it shall be deeply doubled scratched.

(b) When bond coat is hard, but not dry, bring out to grounds with brown coat mortar. Use rod, darby and float to bring to a true, even surface. When this coat is dry, apply the finish coat.

32. For finish coat specifications, see section 49.

(To be Continued)

R. J. Marshall Addresses Toronto Branch, E. I. C., on Testing of Materials

A comprehensive and informative address on "Inspection of Materials" was delivered at the regular weekly meeting of the Toronto branch of the Engineering Institute of Canada last Thursday by R. J. Marshall, president of the Canadian Inspection and Testing Company, in which he capitulated the standard specifications along with methods of test and analysis, and explained the interdependence of inspector, contractor, engineer and vendor in the work involved in any construction.

"Specifications are the working tools of inspectors," Mr. Marshall said, "and, in writing, these should be clearly worded, for the reason, among others, that the inspector may know just what is called for when testing and inspecting the materials." Inspection comprised three processes—visual inspection, actual external inspection, and internal inspection.

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Building Ahead of Last Year

The total awards for Canadian construction for the month of November, according to MacLean Building Reports, Limited, were $15,632,200, compared with $30,078,100 in October, and $21,453,900 in November, 1922. Residential building accounted for 42.8% of the November total, amounting to $6,692,700. Business building amounted to $2,834,900, or 18.1%; industrial building, $733,400, or 4.7%; and public works and utilities, $5,371,200, or 34.4%. The activity was distributed among the groups as follows: Ontario, 47.1%; Quebec, 39.2%; Western, 10.6%, and Maritime, 3.1%.

Construction awards for the year to date amounted to $292,746,800, compared with $259,371,400 during the corresponding period of last year, an increase of 12.8%. During this period residential building shows a falling off of 6.6%, compared with last year; but continues as the most active type of construction, while our [illegible] show an increase of [illegible] respectively, over the same period. The awards were distributed among the [illegible] Ontario 18.5%, Quebec, 3.5 [illegible] 2.9%. The Maritime and Western [illegible] only divisions to display less activity than last year.

There is no ground for pessimism as far as the business outlook is concerned, to the comment of MacLean Building Reports when submitting these figures. Canada's position is fundamentally sound and the course of business is distinctly on the upgrade. The agricultural community, which has borne the brunt of post war adjustment and deflation, is now in a much more healthy position as a result of this year's bumper crop. The influence of this improvement will be far reaching, for practically every line of business in Canada is closely allied or dependent upon agriculture. Leading industries have experienced a fairly profitable season. Labor has been well employed. Weekly bank clearings testify to heavier movements of goods. Railways earnings appear to better advantage. In some spots business is poor, but, regarded as a whole, is in fair volume, and conditions warrant constructive policies.

It is evident that 1924 will witness considerable building activity—probably involving an expenditure of three hundred million dollars in the construction field. Much speculative building activity has been eliminated in favor of investment buildings and other high-class structures, while considerable activity may be expected in the engineering field. Building material prices and the labor situation seem to be fairly stable and it is expected that in 1924 there will only be a slight recession in building costs.

Opportunities that Canada Offers

Are there no inducements that will keep Canadians from emigrating to other countries, particularly the United States, in an effort to better their condition of livelihood? One would almost think so, judging by the numbers of people that have been emigrating from this country since a few years back. It is said that this year Canada's population has actually decreased because of the greater number of persons leaving the country than of those entering it. At any rate, it is certain that in many classes of workers, the ranks have been seriously depleted by a tremendous exodus to the United States, where a labor shortage and, consequently, high wages have offered strong inducements. The extent to which the movement has gone may be appreciated from a statement made a few days ago by a prominent Toronto labor official who stated that twenty five per cent of our skilled mechanics had left the country. Surely the situation, if such is the case, demands urgent remedial measures—something more than just a mere appraisal of the conditions and letting it go at that.

To our mind, it has largely been a case of "distant fields looking green." While many Canadians have gone to the United States and travel, there are thousands whose bubble of hope has been pricked and who are now clamoring to return to this country after brief but sorry experiences in distant cities. What has been responsible for sending these citizens

of men to the United States in the hope of better employment at higher wages? Sir John Willison says it is the strain of pessimism that runs through the current of Canadian life. In an address last week, he stated that "all down the pages of Canadian history one finds the trail of the pessimist. This spirit produces a very unfortunate effect upon the Dominion as a whole and has done much to retard progress during the past half century." He claims that the Canadians who have remained at home have done just as well as those who left to obtain their livelihood elsewhere.

Whether one can call it pessimism or not, the fact seems to be that in many respects Canadians do not boost their country as they ought. Verbal expressions of boasting, in which they freely indulge at times, are just platitudes, unless action accompanies the word and it is in the action that they frequenty fall down. Rosy promises of higher wages and they leave the country! Roger W. Babson told us a few days ago that Canadians are not "sold" on their country. He, an American, had such abounding faith in Canada and its future that he characterized the movement of population away from the country as nothing less than a shame. And he is not far out, we think, in his surmise. We have here in Canada a heritage such as few countries can approach—a heritage of resources that is a guarantee of Canada's future greatness. The realization of that should be brought home to every citizen of the Dominion so that the spirit of optimism will replace the strain of pessimism that is now coursing in the veins of many a Canadian. Canada can offer just as big inducements to the young man as can the United States—perhaps bigger. Just let him appreciate them to their full measure and he will not care to go to foreign lands in search of the fulfillment of his ambitions.

Walls of Building Erected Horizontally

A Scottish architect, speaking on new methods of building stated that perhaps one of the most interesting new methods of construction was that in which the walls were formed on the ground, lying on the flat, hinged at the base, and then raised to the perpendicular by means of winches. The expense and danger involved, however, did not justify the result, according to the architect. The late T. L. Watson, at one time a director of the Royal Technical College, Glasgow, improved on that system by forming the walls also on the horizontal, but hinged along the center of gravity of the walls, and in that way deleted entirely the use of machinery.

The underlying principle was the discarding of moulds or blocks in wall construction. The walls of the house were formed on horizontal platforms a few feet above the ground, and hinged as nearly as possible along the center of gravity, so that when the concrete had set each wall was turned over on its hinges into the exact position. As the platform in its horizontal position balanced in the middle, due allowance being made for door and window openings, it followed that the lower half of the wall, in descending, automatically raised the upper half. No force was required and no apparatus employed (other than rope). The platform was adjusted to its vertical position before the concrete was applied, and the wall naturally assumed its destined place with accuracy.

The door and window frames were laid down on the platform before the concrete was filled in, so that the house was then ready for its roof and internal finishings. The platforms were formed of the roof spars and boarding, and the greater part of the material was, therefore, on the site and ready for use. The time taken to erect the four walls after the concrete had set was only one and a half hours.

The Week's Developments in a Nutshell

The event of the week is, of course, the practical rejection of a protection policy by Great Britain. The effect on Canada will work both ways. Competition in our export trade will be keener. On the other hand a large number of Canadian industries, as, for example, the cotton and woollen industries should profit. British competition in this latter industry has had the effect during the last few months, of reducing Canadian operating profits almost to the vanishing point.

Another effect will be the more aggressive attitude a new government is almost certain to take towards the Franco-German situation. This may be a blessing in disguise. If the continental situation could be improved it would probably more than compensate Canada for any losses she sustains through the rejection of Baldwin's tariff plans.

Retail trade throughout the Dominion has been slower than expected on account of the very mild weather. On the other hand this very condition means almost fully employed labor, savings in fuel and an ultimate greater spending capacity.

The annual reports of many industries are now coming through and, in the main, are better than a year ago. Such lines as flour, milling, iron and steel, building and general construction, both small and large manufacturing, are all in better shape than a year ago. An example is the Dominion Bridge Company which last year earned less than one per cent on its common stock; this year the dividend of four per cent has been earned with a fair margin over.

An announcement of great interest to the building and construction ndustry is to the effect that British capital to the extent of some six million dollars is assured to Calgary next year in connection with elevators, milling, &c.

Hints for the Contractor

Method of Releasing a Mired-Down Caterpillar Shovel

A simple and quick method of getting a 55 ton caterpillar-mounted revolving shovel out of a mud hole is described in a recent issue of The Excavating Engineer as follows:

Ordinarily a shovel has sufficient tractive power to pull itself out of ordinary sink holes with the help of planks, timber and brush, but occasionally the operator may, as this one did, find himself up to the top of his caterpillars in particularly tenacious mud. In this instance one of the caterpillars was all but buried.

Cribbing was placed alongside the low caterpillar. The shovel was swung around and by means of the power boom hoist, the boom was lowered on this cribbing, at the same time the dipper was thrust out as far as it would go.

This cribbing then acted as a fulcrum and the caterpillar was lifted up and planks and timber thrown underneath. More cribbing was added and the caterpillar was free. This fulcrum and lever arm action may be increased by loading the dipper.

Setting Forms on Vertical Curves for Concrete Paving

Regardless of the nicety of the finish on a concrete road it will not possess desirable riding qualities unless the form setting is good. Little trouble is experienced in getting a satisfactory job on tangents and on straight grades. But vertical and horizontal curves frequently present difficulties to the form setter, as is evidenced by many completed jobs in which practically all curves, horizontal as well as vertical, consist of a series of angle points joined by chords. This is especially true of vertical curves, where poor form setting is not noticeable to the eye, but where it is, however, decidedly deficient in riding qualities.

On tangents and on straight grades stakes should be set with a transit every hundred feet to line and to grade. Intermediate stakes can be set with sufficient accuracy by means of Swedish T-stakes. Where vertical curves are circular and not parabolic, the following method has been found extremely practical and simple of application. When correctly applied perfect vertical curves will result. The method is described by R. E. Behrens in "Engineering News-Record."

On vertical curves stakes should be set to grade every 50 ft. with an instrument. The form setter then determines by means of his T-stakes and an ordinary rule how much the 50-ft. stake is above or below the two adjacent 100-ft. stakes (regular stations), depending upon whether the curve is a "crest" or a "sag."

Fig. 1 represents a "crest." Here the form setter will "T" between Sta. 8 and 9 showing that the grade stake at Sta. 8+50 is 5 in. above a straight line from Sta. 8 to Sta. 9. Call this distance "A." He will then stretch a chalk line tightly to grade between Sta. 8+00, 8+50 and 9+00. At the 25 ft. points, i.e., at Sta 8+25 and 8+75 he will set auxiliary grade stakes the grade points of which will be ¼ of "A" or 1¼ in. above the chalk line. Raising the chalk line to the points at the 25 ft. stakes will reveal the outline of the vertical curve. However, his final step will be to raise his forms by ¼ of 1¼ in. or 5/16 in above the chalk line at each 12½ ft. point. If the engineer or the inspector on the job will furnish the form setter with the value of the distance "A" it will save him the operation of "T"ing between the Station stakes. "A" can readily be computed from the plan elevations.

Fig. 2 represents a "sag" or a "trough." Here, again, stakes are set to grade by instrument at Sta

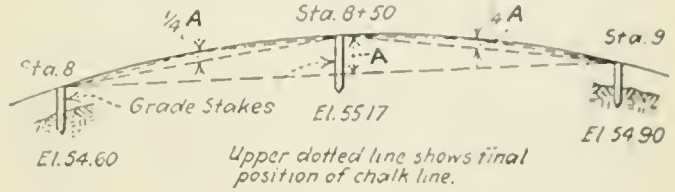


Fig. 1

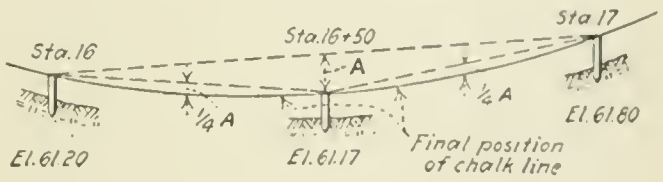


Fig. 2

Method of form setting on vertical curves

16+00, 16+50 and 17+00. The form setter by the use of his T-stakes has determined that Sta. 16+50 is 4 in. ("A") below a straight line from sta. 16+00 to Sta. 17+00. After stretching his chalk line tightly from Sta. 16+00 to 16+50 and from 16+50 to 17+00, he allows it to drop or sag by an amount equal to ¼ "A" or 1 in. at the 25-ft. point. The chalk line will then show a perfect vertical curve, and the forms can be set directly to the line.

The above method of measuring mid-ordinates can be used equally well on horizontal curves.

When once thoroughly explained and demonstrated to a form setter, the latter will pride himself with possessing a "system" and better form setters will result.

Trade Incorporations

A recent registration at Montreal was that of Stonger, Thompson & Co., to carry on an engineering and contracting business. Messrs. Stanley Stonger and Cecil Thompson are the principals.

Obituary

Mr. George L. Rambo, [illegible] years an engineer in the Department of the Interior, Ottawa, died recently from injuries sustained when he was struck by a motor car in that city recently.

Should Building Supply Dealers Have a Credit Bureau?

Exchange of Ledger Experience Through a Central Organization Would Put Business on a Sounder Basis

The utilization of ledger experience has had the effect of creating a strong co-operative spirit among business men in all trades and industries where it has been put into practice. There is no credit information more eagerly sought, nor in which the business man, or his credit man, takes a more intense interest than in ledger experience. The tendency on the part of merchants and manufacturers who work to achieve the common object of reliable credit information, is to organize in associations, bureaus and the like, and this has brought to light the dependence which each must place upon the other, and the splendid results of such dependence. It has had another and equally valuable effect, and that is to make men in business entertain closer and friendlier relations with each other, thus inducing expressions of that complete confidence essential to thoroughly developed and elevated business standards and morals. Thus does G. W. Hafner explain in "Building Supply News" the value of a credit bureau for building supply dealers. The details of such a scheme he outlines as follows:

Reliability of Credit Information Biggest Difficulty

Now the main cause underlying the establishment of credit bureaus of this kind is the difficulty of determining accurately the reliance to be placed upon general credit information, such as is furnished by the commercial agencies, for instance; or, on the other hand, such as any man in business is able to obtain single handed. This applies with peculiar force to the retail building supply and lumber business, where sales are made to contractors and others, many of whom are not listed in the rating books of the agencies. It is the opinion of those engaged in credit work that there should be some substantial accuracy to the mercantile agency information.

Such conditions as these have called credit interchange into being. It is a credit clearance system. Its use is to locate the individuals or firms with whom a customer is dealing, and, having found them, to initiate an investigation as to the standing upon their books of the applicant for credit. Such an investigation is generally very extensive, affording a mass of reliable information.

Dealer in Position to Give Information

Any building supply dealer is in a position to procure information of a vital character in regard to the standing of the people to whom he sells. He can tell whether a man is prompt or slow in his payments, whether he shows a disposition to pay his bills or not; whether his general methods indicate that he has a fair understanding of good business methods; or, on the other hand, whether he shows a tendency to sharp practice and is unsatisfactory and troublesome.

When business men organize their own credit bureaus there is no necessity for anything more than nominal, and, in most cases, no capitalization. The information is furnished voluntarily by the members of the bureau; and the clearing of such information to interested members should require but two or three competent clerks, depending, of course, upon the number of co-operating members. No supervision should be required after the methods are designed and put into operation, since the procedure in all cases is practically similar—in fact, a good credit interchange system is essentially automatic in its workings.

Maintaining Bureaus at Lowest Cost

This means that the amount of expense to be borne by each individual member of the bureau would be extremely low. Now, this question of expense is a very important one, and has a vital bearing upon the success of any credit-interchange bureau, for the simple reason that if the cost is small, the willingness of material and lumber dealers to avail themselves of the service will be more pronounced than if the expense entailed be an onerous one. While this would not apply so much to the larger concerns, it nevertheless has a very decided bearing on the ability of the vast majority of dealers to use the service. It is, of course, unnecessary to state that the success of your plan depends almost entirely upon the universality of the support given it—that is, assuming a workable, practicable plan to start with.

The Working of a Credit Bureau

To give you a general idea of the workings of a credit-interchange bureau of the kind you evidently have in mind, it may be stated that a good plan is substantially as follows:

An office is established in charge of a secretary or clerks. The names of the dealers desiring to participate are listed and a number assigned to each concern. Printed copies of the list are distributed, so that each member will know his own number and also be able to identify any other concern by its number whenever the latter shall appear upon communications sent to him. Each member is supposed to submit to the office a list of all his customers. A card is made out bearing the name of each customer. Upon this card is entered the numbers representing the concerns who are selling to this particular customer.

Let us assume that the Jones Building Material Co. has received an order for $500 worth of material from John Smith, contractor, and Jones decides to investigate the general standing of Smith before delivering the order. He therefore sends to the office

of the credit bureau an inquiry ticket, upon which he enters the name of John Smith.

The inquiry slips are entered upon report sheets, one sheet being made out for each member whom the cards show has been dealing with any of the names listed, and the report sheets are delivered to the interested members by mail or messenger. The interested member is supposed to enter opposite the names appearing on the sheet statements of his experiences. The information generally asked is the amount owing, the amount overdue, the manner of payment, and any remarks that the concerns reporting consider necessary or advisable to make. The manner of payment is generally indicated by symbols.

This is, of necessity, the barest outline of a comprehensive plan, and, of course, you realize that the forms necessary to carry out this idea must, first of all, be drawn up and printed, and that the machinery of the plan must be set in motion by some individual who knows what he is about.

Educating Architects Regarding Building Materials

Committee Representative of Interests Concerned Seeks to Establish a Structural Service for Architects and Engineers

In July last, at the suggestion of the president of the Ontario Association of Architects, manufacturers interested in the production of building materials were invited to confer with the architects at their annual convention, with the object of developing a closer relationship so as to provide for the more extensive use of Canadian building materials. The proposal met with an enthusiastical response, it has since been endorsed by the Royal Arichitectural Institute of Canada, and those who are in a position to speak on behalf of the Engineering Institute are equally sympathetic. A committee has been organized representative of architects and manufacturers and at the request of this committee a circular is being distributed by the Canadian Manufacturers' Association for the benefit of those who are concerned in the production of building materials. This circular explains the work in mind as follows:

The committee proposes to follow the lines of what is now an established and recognized method in use by the structural service committee of the American Institute of Architects, on which producers are represented. This structural service committee has developed a standard filing system for all advertising material sent by producers to architects and engineers, it tenders advice to advertisers in respect to subject matter in which architects and engineers are interested, and supplies information respecting tests and other scientific data relating to building materials.

The Canadian committee desires that all Canadian producers of building materials who seek, by advertising, to interest architects and engineers, should give immediate consideration to this proposal under the following headings:

(a) That advertising matter for distribution, such as catalogues, descriptive booklets, pamphlets, etc., conform to what has now become almost universally recognized as standard size, viz., 8½in. by 11 in.

(b) That the subject matter either by description or illustration, tell the architects and engineers what they need to know in order to appraise their clients of the merits of the product or to introduce it properly into their specifications.

(c) That information respecting authoritative tests, standardization, or simplification be developed and published to the architects and engineers.

The standard size for catalogues has been generally accepted although not necessarily followed, but the Association of Canadian Advertisers and the Canadian Purchasing Agents' Associations as well as a number of associations in the United States, have laid it down as good practice, so that it now remains for what has almost come to be considered as general agreement, to be universally followed. This permits of filing in the offices of architects and engineers and if dates of issue are stamped on all such matter the members of these professions eventually will have an authoritative, loose-leaf, comprehensive catalogue of Canadian building materials. The American Institute of Architects issues an indexed classification for all such material and it is the aim of the Canadian committee that we should in a short time be able to build up a similar structure in Canada.

Having regard to paragraphs (b) and (c) above, it is submitted that these are subjects which should be taken up by interested trade associations. Standard specifications are now used in some lines of manufacture. This is information in which the architect and engineer are especially interested. They need information of this kind in order to sell your product to their clients.

Some trade associations are already developing data, others will take it up shortly. The co-operation of all manufacturers of products wherein the architect or engineer is part of the chain of distribution is desirable in order to overcome certain well-known disadvantages we labor under through our close proximity to a highly organized industrial nation.

November Building is High in Winnipeg

Hitting a new record for late fall building Winnipeg's construction programme for November was more than 100 per cent. ahead of the corresponding month last year and exceeds November records for some years back, according to permits taken out at the city building inspector's department. The statement for November shows $434,250 worth of permits issued as against $211,850 for November, 1922. The spread in construction was due chiefly to the $300,000 permit issued early in the month for the Winnipeg Electric Railway Co.'s coke ovens for the new gas plant.

There were 10 houses started during the month also and a satisfactory amount of smaller jobs. The increasing activity this autumn was not sufficient to overtake the lethargy of the spring and summer, however, and leaves the year's total $2,400,00 short of last year. To November 30, $4,446,150 worth of building was undertaken as against $6,838,400 to November 30, 1922.

Ammonia Compressors

The Canadian Ingersoll-Rand Co., 260 St. James St., Montreal, have issued bulletin K-314, descriptive of class ER-A and ER-A steam and belt driven ammonia compressors.

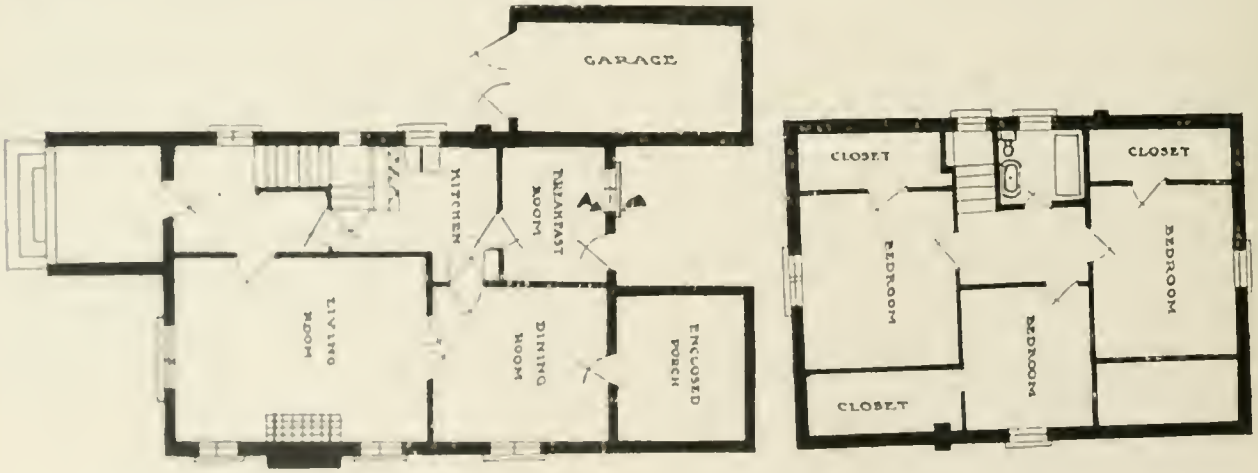
The Contract Record's
Weekly House Suggestion No. 92

This handsome residence was erected recently on Montclair Avenue, Toronto, in the beautiful St. Clair residential district, by Mr. H. C. Willson, 1302 Ossington Avenue, Toronto. The general construction is carried out in hammered stone, with stucco and half timbering effect on the second floor. The exterior trim on windows, doors, main entrance porch, etc., is also carried out in stone. The roofing is of stained shingles. The house is especially adaptable to a narrow lot, yet the rooms are all of a good size and well located with relation to each other. There is an entrance on the side which gives convenient access to the basement and to the kitchen quarters. The living room and dining room are both large rooms. The former is equipped with a handsome cut stone mantel on the right and opens on the dining room through double French doors. The dining room opens on an enclosed porch at the rear. The interior trim throughout is in gumwood with the exception of the kitchen and breakfast room, which are in birch. The flooring throughout is of quarter cut oak.

Below the living room, in the basement, and occupying exactly the same space as this room, is a billiard room, equipped with a stone mantel and handsomely trimmed. The balance of the basement space is taken up with laundry, boiler room and coal room.

The upstairs plan provides three roomy bed chambers and combined bathroom and toilet, all conveniently arranged off the short hall. Trim is of gumwood, with the exception of the bathroom, which has tile floors and walls to a height of 4 ft. The flooring in the balance of the second floor is of quarter cut oak as downstairs.

Mr. J. E. Willson, 1302 Ossington Ave., designed this house.



Mainly Constructional

East and West—From Coast to Coast

The contracting firm of Larose & Lavalee, at Montreal, has been dissolved.

A recent report is to the effect that Toronto may have another large office building, at the corner of Adelaide & Victoria Streets. The report states that plans have been prepared by Mr. James J. O'Neill, owner of the property at the southwest corner of the above streets, for a 12-storey office structure to cost $800,000.

The Canada Steamship Lines, Limited, will present a bill at the next session of the Legislature asking for the confirmation and the ratification of a by-law passed by the corporation of Cap de la Madeleine, near Three Rivers, P. Q., regarding the establishment of shipbuilding yards in that municipality. The special act will also affect and confirm a deed agreed upon between the interested parties.

The municipalities of North York and Leaside, Ont., are considering the opening of Eglinton Avenue through to Don Mills Road, which will mean the construction of a new bridge over the Don River.

Without a dissenting vote, the Works Committee at Toronto a few days ago again approved the North Toronto sewerage scheme and recommended it to Council for adoption. A deputation appeared from North Toronto and urged that the work be completed as speedily as possible.

The campaign to raise $100,000 for the Memorial Hospital, at St. Thomas, Ont., was brought to a successful conclusion a few days ago. Although the exact amount collected is not known at this writing, it is believed that the objective has been realized with a good margin to spare.

The Catholic School Commission at Quebec, recently decided, at one of their weekly meetings, to ask the provincial legislature for borrowing powers to obtain the sum of $500,000, to finance proposed construction and to pay off the bulk of debts now on their hands.

Purchase of a half million dollar waterfront property, known as the Government dock, at Fort William, Ont., by James Playfair, Midland, Ont., was announced recently. The Government dock was held by the Canadian National Railway through absorption of the Grand Trunk Pacific and was the nucleus of a great terminal scheme planned by the G.T.P., which became unnecessary by the amalgamation. It consists of 600 feet of waterfront land in the heart of Fort William between Ogilvie's elevator, the C.P.R. subway and the railway tracks.

The first sod was turned in connection with the new $10,000,000 plant of the Dominion Alloy Steel Company at Sarnia a few days ago when about a dozen men began sinking holes on the site, six feet by 15 feet, to determine the nature of the soil on which the foundations of the new plant will be laid.

The A. B. Ormsby Co. Ltd., Toronto, have purchased the factory building at 138 to 166 Van Horne St., from the Sorenson Sheet Metal Company, for $50,000, and will transfer their present plant to the new premises. The building is a two-storey structure and the property has a frontage of 210 ft. on Van Horne St.

Application was made recently by Roberts Bros., builders, of Toronto, for a permit to erect four large apartment buildings on Spadina Road, Toronto, at a total cost in the neighborhood of $1,000,000. Plans have been prepared by Major N. G. Biggs, who designed the Ernscliffe Apartments and other large buildings of this type in the city. The request for permit is receiving the support of the local Trades and Labor Council, as the builders propose to negotiate [illegible] on the work, if the permit is granted. [illegible] step in the direction of relieving Toronto's unemployment problem this winter.

Mr. George Drew, architect to the Ottawa Realty Syndicate, 20 Prince St., Oshawa, Ont., is interested in receiving prices and catalogues on wholesale brick, lumber, tile, plaster, cement and general building supplies for their 1924 requirements.

The Royal Canadian Academy of Arts, Montreal, has offered a traveling scholarship of the value of $1,500 to Canadian architects, with the object of promoting the conception of architecture as the mother of arts, by encouraging an understanding by architects of mural decoration, sculpture, ornament and craftsmanship. The scholarship is restricted to Canadian citizens of at least six years' residence in Canada and of not over thirty years of age.

British Empire Steel Corporation made good production records during November, especially in certain lines. The coke output for the month was approximately 36,000 tons. Tar production jumped to about 600,000 imperial gallons during the month, probably a record for the plant. Other figures are:— Sulphate of ammonia, 675 gross tons; sulphuric acid, 1,100 net tons; crude benzol, 170,000 imperial gallons; motor fuel, 105,000 imperial gallons. Iron production at the plant for the month was 29,500 tons. Other production figures at the plant are as follows:—Blooming mill, 21,000 gross tons; billet mill, 16,500 gross tons; rod mill, 8,000 gross tons. The rail mill closed down on Nov. 3rd. For the first three days of November, 576 tons of billets were produced. Bar and rod mill working single shift produced 1,200 gross tons of rods and bars; sixteen-inch mill, 1,300 gross tons; wire, 3,200 net tons; nails, 900 net tons; Dominion Steel (special roofing nail) 35 net tons; galvanized zinc department, 1,100 net tons; staples, 100 net tons; clay brick, 100,000; silica brick, 145,000.

A recent report from England states that the huge building at Wembley, which will house the exhibits from the Dominion of Canada, in connection with the coming British Empire Exhibition, is about completed. The only work remaining to be done is a few finishing touches on the exterior and the interior trim and decoration. The Canadian pavilion is a large structure, of neo-Grecian design, built somewhat along the lines of the Louvre at Paris.

The Combustion Engineering Corporation, Ltd., Bank of Hamilton Bldg., Toronto, have been appointed Canadian representatives for the R. H. Beaumont Co., of Philadelphia, manufacturers of coal and ash handling equipment.

Personal

Mr. A. A. Carpenter succeeds G. H. V. Bulyea as chairman of the Public Utilities Commission, at Edmonton, Alta.

Mr. A. M. Kirkpatrick, resident government engineer for Goderich, Bayfield, Kincardine, Southampton and Tobermory harbors, went to London recently where he will act as assistant to Mr. H. B. R. Craig, district government engineer for Western Ontario, owing to the leave of absence granted W. J. Forbes-Mitchell, Mr. Craig's assistant, due to ill-health.

Mr. Rene Chenevert will succeed his late partner Mr. Emile Tanguay, as architect of the Catholic School Commission at Quebec.

Mr. E. Cowan, engineer with the Fegles Construction Company, Fort William, Ont., has been appointed mill engineer for the St. Lawrence Pulp & Paper Co., at Three Rivers, P. Q.

Mr. O. O. Lefebvre, who recently resigned as chief engineer of the Quebec Streams Commission, has been elected chairman of the Montreal Branch of the Engineering Institute of Canada.

CONSTRUCTIONAL ACTIVITY

Period of December 5 to December 11, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Bridgeburg, Ont

Fitzbourke Twp., Ont

Ford, Ont

Ottawa, Ont

Port Colborne, Ont.

Wallace Twp., Ont.

Wentworth Co., Ont.

CONTRACTS AWARDED

Fitzbourke Twp., Ont.

Edmonton, Alta

LaSalle Que

by Francis Hankin & Co., Ltd., chlorinating plant by E. Laurie & Co. Both of Montreal. Engineer in charge is J. V. Hoy, Room 209, 71a St. James St., Montreal.

New Westminster, B. C.

The contract for bank protection has been awarded to Vancouver Pile Driving & Contracting Co., Vancouver, B. C., at $47,961.

Quebec Province.

Provincial Government Department of Roads has awarded the following contracts for gravelling roads: Calumet Village, Co. Argenteuil, on Montreal-Ottawa via Hull Highway—H. Marchessault & Co., 2507 Lafontaine St., Montreal at $3,746.20; Yamachiche Village, Co. St. Maurice, on Quebec-Montreal highway—B. J. Trepanier, 333 Notre Dame St., Three Rivers at $5,301.-50. Tache Twp., Co. Chicoutimi; on St. Bruno-Roberval St. Bruno highway—Chs. Potvin & Adelard Renaud, Delisle, Co. Lac St. Jean at $23,631.90; St. Joseph Village, Co. St. Hyacinthe; on St. Hyacinthe-Melbourne highway—Tetrault Construction Ltd., St. Germain de Grantham, Co. Drummond at $2,793.26; Parish of St. Hyacinthe Le Confesseur, Co. St. Hyacinthe, on St. Hyacinthe-Melbourne highway—Tetrault Construction Ltd., St. Germain de Grantham at $19,144.44; Hampden Twp., Co. Compton—Samuel G. Scott & Robert E. Scott, Scotstown, Co. Compton at $4,461.76. Work to start in spring.

Welland, Ont.

The city council has awarded the contract for sewers on Cozy St., to C. J. White, 156 Main E., at $987.55.

Winnipeg, Man.

The city of Winnipeg has awarded the following contracts for cast iron water pipe. National Iron Corporation Ltd., Toronto, for 500 ft. 4 in. pipe at 65 cents ft.; 3,000 ft. 6 in. at $1.00 ft.; 1,000 ft. 10 in. at $1.90 per ft. Empire Waterworks Supply Co. of Canada, Ltd., for 1,500 ft. of 14 in. pipe at $3.23 per ft.

York Twp., Ont.

The following contracts for watermains have been awarded by the township council: Eglinton and Glebholme Ave., L. C. Shipps, 1609 Queen W., at $1,250. Eaton and Don Mills Rd., township engineer, F. Goedike, 10 Jarvis St., Toronto at $1,000.

Railroads, Bridges and Wharves

Chatham, Ont.

Plans are being prepared for the erection of a steel bridge over McGregor's Creek near here, for Pere Marquette Railway, St. Thomas, Ont.

Lingan Bay, C. B.

Work has just started for the erection of $30,000 steel bridge here. J. E. Bellivеau, Parliament Bldgs., Halifax, is the assistant engineer in charge.

Pembroke, Ont.

A By-law was recently passed by the ratepayers, for the erection of a bridge at St. Mary St., over Muskrat River, to cost $75,000. Bridge will consist of three 90 ft. steel spans.

Rimouski, Que.

Tenders are being received till December 27 by the Dept. of Public Works, through the secretary, L. H. Colman, Parliament Bldgs., Ottawa, Ont., for the construction of wharf here to cost $20,-000. Plans and specifications at department; offices of district engineers, Lower St. Lawrence Power Bldg., Rimouski. A 10% accepted cheque required.

CONTRACTS AWARDED

Quebec Province.

Dept. of Public Roads has awarded the following contracts for bridges to be built in this province; contract awarded for 3 bridges in Chateau Richer Parish to T. E. Rousseau Ltd., Limoilou, Quebec; contract awarded for 1 bridge in Petit Lac Magog to Kennedy Construction Co. Ltd., 137 McGill St., Montreal $5,300. Work to start shortly at Petit Lac Magog.

Quebec Ouest, Que.

The town council has awarded the contract for iron bridge to be built on Marie de L'Incarnation St., to T. E. Rousseau Ltee, Limoilou, Que.; also for erection of iron bridge "Scott." Ivan Vallee, Parliament Bldgs., Quebec, is the engineer.

Mouton County, Que.

The general contract for 3 reinforced concrete bridges to be erected in parishes of Chateau, Richer and L'Ange Gardien, on Quebec-St. Simeon highway, has been awarded to T. E. Rousseau, Ltd., Limoilou, Que., at $10,434.30.

Prairie Siding, Ont.

General contract for bridge to be built over River Thames, has been awarded by the Kent County to Can. Des Moines Steel Co., Chatham, Ont., at $78,340. Engineer is W. G. McGeorge, C. E., Chatham, Ont. General contractor for abutments, Wm. Bermingham & Son, Kingston.

Whitby, Ont.

W. H. Harvey, Deseronto, Ont., has been awarded the general contract for rebuilding trestles, Whitby to Bomanville, Ont., at $20,000.

Public Buildings, Churches and Schools

Belleville, Ont.

Work is to start at once for church to be built on Coleman St. for Standard

Church of America. Work day labor by congregation

Charlottetown, P. E. I.
Prince Edward Island Hospital contemplate alterations and improvements to the hospital, at a cost of $70,000

Halifax, Ont.
The erection of a $70,000 fisheries experimental station here is contemplated by Dept of Marine & Fisheries. This will consist of a model fish drying plant, model smokehouse, a lecture building including chemical laboratory.

Harvey, Que.
The school board contemplate the erection of a new school here.

London, Ont.
Revised tenders are being received from the four lowest tenderers, closing with architect December 15, in connection with $500,000 seminary to be built here for St. Peters Seminary, Dufferin Ave. Architects, Pennington & Boyde, Bartlett Bldg., Windsor, Ont.

The ratepayers of London, Ont., recently defeated a By-law for the erection of a $600,000 city hall here.

Montreal, Que.
Tenders will be called December 10, closing December 15, by the architect, E. A. Doucet, 195 Ste Catherine East, for public hall and office building to be built corner Bonsecours and Champ de Mars, owned by Debardeurs Syndiques di Port de Montreal. Plans and specifications with architect.

Viau & Venne, St James St., are preparing plans of college to be built on Decelles St. for St. Marys College, 232 Bleury St.

Scarboro Twp., Ont.
The township council propose building a fire hall on Danforth Road near provincial highway.

St. Thomas, Ont.
A By-law for the erection of $40,000 public market, corner Talbot and Manitoba Sts., has been defeated by the ratepayers.

St. Catharines, Ont.
A By-law for the erection of $30,000 stadium here, was recently defeated by the ratepayers.

Toronto, Ont.
Tenders in connection with completion of assembly hall for Humberside Collegiate, have been referred back to property committee, which meets on December 13.

Humewood House, west side Humewood Drive, contemplate $50,000 addition to children's home.

E. J Lennox, 364 Bay St., is preparing plans for alterations and addition to Western Hospital buildings.

The Board of Education contemplate an addition to Harbord Collegiate.

CONTRACTS AWARDED

Alexandria, Ont.
The walls are going up for $32,000 public building being built here. Following sub-trades have been let; plumbing and heating—Erskine Smith & Co.; tile and marble—A. K. Mills; roofing and sheet metal—McFarlane-Douglas Co.; stonework—Oscar Noel, Hull P. Q.; plastering—Murphy & Morrow; steel—Dominion Bridge Co. Ltd.; electric—Marchand Electric Co.; painting—W. J Carson, Laurier Ave. W.

Gore Bay, Ont.
General contract for addition to court house here has been awarded to Edward Charters, 139 Spring St., Sault Ste Marie, Ont

Montreal, Que.
Alphonse Gratton, 511 Ste Catherine W. has been awarded the general contract for altering and adjoining old building on Sherbrooke St E., into Hospital at a cost of $200,000, owned by Notre Dame Hospital, 551 Notre Dame E. Architects are A. H. Lapierre 30 St James St., Montreal, and Stevens & Lee, 62 Charles St. E., Toronto, Ont

Sackville, N. S.
The following sub-contracts have been let on $29,800 post office being built here; steel work—Eastern Canada Steel & Iron Works, Ltd., Quebec, Que.; masonry—Nova Scotia Clay Works, Amherst; millwork—Rhodes Curry, Ltd., Amherst; plumbing and heating—Byrne & McGeouch, 128 Germain St., St. John. General contractor is E. F. Powers Construction Co., St. John.

Sydney, N. S.
Campbell & Desmond, Charlotte St., have the contract for electrical work on $45,000 community building being built for Presbyterian & Methodist Missions. General contractors are Chappells Ltd., 62 Brookland St. Painting and glazing by general contractor.

St. Lambert, Que.
H. Gravel, 129 St. Denis St., has been awarded the general contract for $10,000 public building to be built here. Engineer in charge is J. Kellett.

St. Perpetue, Que.
General contract for $90,000 church to be built here for R. C. Parish, has been awarded to Paquette & Roberge, Ste. Marie de Beauce, Que.; structural Steel—Phoenix Bridge & Iron Works, Montreal; painting—M. Lachance, Levis, Que.; sculpture—M. Charbonneau, Que, Que. Architect, Louis Caron, Nicolet, Que.

Stoney Point, Ont.
Louis St. Denis, Ford, Ont., has the general contract for school to be built here for Separate School Board. Heating, painting, plastering, plumbing, and electric to be let. Architect, G. J. P. Jacques, Windsor, Ont.

Toronto, Ont.
Taylor Bros., 25½ Norwood Rd., have the electrical contract on $100,000 addition to Danforth Ave. Methodist church. Architects, G. M. Miller & Co., 93 Yonge St

The Board of Education has awarded Art Wire & Iron Co., the following contracts for ornamental iron work-Silverthorne school, $4,750, and Riverdale Collegiate $2,422.

Taber Ford Construction Co., Ltd., 533 St. Clair Ave W., have the general contract for addition to Sunday school of Boon Ave. Baptist Church Congregation, and want prices on excavating, electric, painting and steel. Masonry roofing and tiling to be let.

W. E Dillon Ltd., have the contract for roofing and sheet metal work on college buildings being built on Hoskin Ave for Trinity College. Architects, Darling & Pearson.

Timmins, Ont.
The walls are going up for [illegible] high school here; [illegible] contract has been let to [illegible] Prue & Co., Ltd. Plastering [illegible] Pennington & Boyde, Windsor, [illegible] architect, I. W. Leighton, Windsor

Vancouver, B. C.
Pacific Construction Co. Ltd Vancouver, have been awarded the general contract for $100,000 grain jetty owned by Board of Harbor Commissioners. Architect, Major W. G. Swan 712 Pender St. W., Vancouver

Business Buildings and Industrial Plants

Arnprior, Ont.
An addition to hotel on John St., owned by J. R. Byrne, is contemplated. Cost of work is estimated at $25,000. Work to go ahead in spring

Cornwall, Ont.
C. R. Tetley, 314 Beaver Hall Hill Montreal, Que., is preparing plans of $2,000,000 silk factory to be built here for Courtaulds Limited, Coventry, England. Tenders for this work will be called by the architect in the spring

Capreol, Ont.
Pine Products of Canada Ltd., of Toronto, Ont., contemplate building a factory here for the manufacture of pine tar, turpentine, etc. Work will go ahead in the spring.

Cooksville, Ont.
Shale Brick Co. of Canada, Ltd., Toronto, contemplate an extension to their machine shop.

Hull, Que.
Canadian Mirror & Novelty Mfg. Co., contemplate an addition to their factory here.

Fraser Jct., B. C.
McLean Shingle Co., Ltd., New Westminster, B. C., are having plans prepared of $60,000 shingle mill to be built at Fraser and Pitt Rivers Junction.

L'Islet, Que.
Work is now under way for $15,000 factory being built here for Eugene Gagnon. Work day labor under supervision of owner.

Lauzon, Que.
The foundations are in for $10,000 club hall for Nationale de Ouvrieres de la Rive Sud. Work by day labor.

London, Ont.
Plans are being prepared for garage repair shop and service station on York St. W. J Chisholm, 475 Richmond St is the owner.

Montreal, Que.
D. J. Crighton, 551 Oxenden Ave., is preparing plans of moving picture theatre to be built on Park Ave near Bernard, owned by United Amusement Co., 424 St. Catherine St. W.

Mission, B. C.
J. R. Mathers, Mission, B. C., is owner and builder of $12,000 planing mill to be built here

Ottawa, Ont.
Foundations are in for stores and garage corner Bank and Argyle Sts. Ten-

Province of Quebec.

Part Burwell, Ont.

Point Edward, Ont.

Prince George, B. C.

St. Catharines, Ont.

Toronto, Ont.

Welland, Ont.

Winnipeg, Man.

CONTRACTS AWARDED

Edmonton, Alta.

Deschenes, Que.

Ford, Ont.

Excavation work is in progress for ... branch bank of Provincial Bank of Canada, Montreal. Following sub-trades have been let; steel—Canadian Bridge Co.; steel sash—Trussed Concrete Steel Co.; sheet metal, plumbing and heating—Alex. White, Windsor, Ont. General contractors are Windsor Construction Co., Ltd., Walkerville, Ont. Architect, G. J. P. Jacques, Windsor, Ont.

Kitchener, Ont.

Reitdel Bros., Waterloo, Ont., have the general contract for $45,000 addition to warehouse on King W., owned by M. B. Shantz. Architects, Schmaltz & Jones, 15 Queen St. S.

Montreal, Que.

Excavation work is being done for theatre, stores, bowling alleys and flats, costing $200,000 on Bernard Ave. Leger & Lamoreux, St. Denis building, 294 St. Catherine E. are the general contractors, and are in the market for all materials. Architect, R. Gariepy, 15 St. James St.

Pouring concrete 6th floor is in progress on $1,100,000 office building being built on Bleury Street. Plastering contract has been let to Frs. Beaudoin & Fils, 62 Christophe Colomb. Architects, McVicar & Heriot, 628 Union Ave. General contractor is C. Archambault, 610 Lafontaine Park.

Campbell Gilday Co., Ltd., have the contract for roofing in connection with repairs to garage costing $8,000, at 195 Mountain St., owned by Bell Telephone Co. Cook & Leith are the general contractors.

Ottawa, Ont.

The walls are going up for $8,000 addition to store on Rideau St., owned by A. Shaffer, 147 Rideau St. Following sub-trades have been let; electric—Marchand Electric Co.; plastering—M. Normand, St. Patrick St. Painting by day labor. General contractors are Ferguson & Lambert, 613 King Edward Ave.

Port Colborne, Ont.

Excavation work is being done for $9,000 garage on Fraser St., owned by Harry Sidey. Geo. Habel has the contract for masonry. No sub-contracts let.

Quebec, Que.

The walls are going up for $300,000 hotel "St. Roch," at 234 St. Joseph St. Iron fire escapes being supplied by P. Marchand, 265 St. Valier St., at $2,000. Owner of building is J. Oscar Gilbert ... Lockwood St.

Renfrew, Ont.

Foundations are going in for factory being built here for Seaman-Kent Co., Ltd., of Toronto. General contractors and engineers are Wells & Grey, Ltd., Toronto.

St. Hyacinthe, Que.

Daniel & St. Jean, St. Hyacinthe, Que., have the roofing contract for $40,000 addition to factory of Penman's Ltd. Balance of work by day labor.

Stratford, Ont.

Partridge Bros., Ontario Street, have the plumbing and heating contract in connection with addition and remodelling "Majestic Theatre" to cost $10,000, noted by A. Brandenberger, Wellington St.

Truro, N. S.

Work is in progress for repairs to stores and offices on Inglis street, owned by Estate of Dr. McKay. General contract has been awarded to W. K. Murray.

Toronto, Ont.

Lioni & Co., 1166 Dufferin St., have the contract for excavation work for $125,000 light manufacturing building being built at 207-215 Richmond West for Gelber Bros., Ltd. Architect, Benj. Brown, 287 Spadina. General contractors, Dowling & Williams, 167 Yonge St.

Vancouver, B. C.

Archibald Rodger, 2998 Third Ave., W., has the general contract for alterations to stores, $10,000, corner Robson and Thurlow, owned by Dr. David H. Wilson, 1966 Haro St. Electric, plumbing, plastering, painting and glazing not yet let.

North West Dredging Co. have the general contract for $150,000 grain jetty to be built on east side government dock.

Waterloo, Ont.

Ellert Bros, Park Ave., are the general contractors for $9,500 warehouse being built on King St. for O'Donnell & Henderson. Electric, heating and painting to be let.

Welland, Ont.

Foundations are in for pipe storage building for Page-Hersey Tubes, Ltd., Toronto. Foundation work is being done by Diffin Construction Co., Welland, Ont. Structural steel—Standard Steel Construction Co., Welland.

Windsor, Ont.

Foundations are in for $200,000 ice plant, owned by Empire State Ice Co., of Chicago and Windsor. Following sub-trades have been let; general contract—Blome Sinek Co., Chicago; steel—Canadian Bridge Co., Ltd.; plumbing—Windsor Plumbing & Heating Co.

Residences

Cooksville, Ont.

Foundations are in for $6,000 residence being built on Melville Park. W. F. B. Rubidge, Port Credit, Ont., is the owner and builder.

Wm. Morris, Erindale, Ont., contemplates building 3 residences on Agnes St. No material purchased.

Dunnville, Ont.

The walls are going up for 3 residences, $3,500 each, west side of John St. Aden Foster is the owner.

Hamilton, Ont.

W. Ellis, Normanhurst Ave., is owner and general contractor of 5 residences, $7,500, on Strathearn Ave., and will let sub-trades and buy materials.

A. Bolingbroke, 95 Ottawa St. S., is the owner and general contractor of 3 residences, $7,500, being built on Cluny Ave., and will let sub-trades.

Work has just started for 2 residences, $8,000, on Westdale Ave. Blain Bros., 127 Emerald St. N., are the owners and general contractors and will let sub-trades and buy materials.

Islington, Ont.

J. Hunt Stanford & Son, 67 Yonge Arcade, Toronto, Ont., are preparing

plans of $10,000 residence to be built here for S. B. Pretty, 16 Delaware Ave.

Kitchener, Ont.

Work is to start shortly on $5,000 residence being built on Louisa St., by Ellert Bros., Waterloo, Ont.

Montreal, Que.

Framework is going up for 2 residences, $10,000, on 4th Ave. between Masson and Dandurand. N. L. Leger & Co., 5521 Fourth Ave. is owner and builder. Brickwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

J. D. C. Martin, 266 Ontario E., is owner and builder of $8,000 residence on Old Orchard between Monkland and Cote St. Luc. Sub-trades to be let.

J. Hoolahan, 601 Old Orchard, is owner and builder of 4 residences, $25,000, on Old Orchard, near Monkland. Sub-trades to be let.

A. Leclaire, 120 Leclaire, is owner and builder of 5 residences, $60,000, on Ville Marie, between Ste. Catherine and Notre Dame. Sub-trades to be let.

Owen Roberts, 6967 Sherbrooke W., is owner and builder of 6 residences, $36,000, on Hampton Ave. and Monkland, Notre Dame de Grace. Masonry, marble and tiling, millwork, roofing, electric, plumbing, heating, plastering and painting to be let. Carpentry by day labor.

F. Pepin, 1267 Des Erables, is owner and builder of $8,000 residence on St. Denis, between Isabeau and Castelneau. Sub-trades to be let.

Framework is going up for 2 residences, $12,000, at 3563 Berri St. L. Champagne, 3567 Berri St., is the owner and builder. Brickwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Foundations are going in for 3 residences, $31,000, on Girouard, between Cote St. Luc and Monkland. O. Brunet, 425 St. Antoine, is the owner and builder. Sub-trades to be let.

E. Parent, 347 Sixth Ave., Ros., is owner and builder of 2 residences, $8,000, on Letellier, near Blvd. Gouin. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Foundations are going in for 2 residences, $20,000, on Christophe Colomb, between Bellechasse and Beaubien. W. Deslauriers, 651 De Gaspe, is the owner and builder. Architect, Chas. Bernier, 70 St. James St. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

J. Davis, 3 Burnside Place, is preparing plans of 10 storey apartment house to be built north east corner Burnside Place and Mansfield St., owned by the Senneville Apartment, Ltd., care Campeau & Denis, 68 St. Denis St.

Framework is going up for 2 residences, $12,000, on Des Erables, near Masson. Owner and builder is J. B. Seguin, 308 Gilford. Brickwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Foundations are in for $10,000 residence on Lafontaine, between Bennett and Aird. E. Simard, 444 Orleans, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

O. Vincent, 141 Demontmollin, is the owner and builder of a residence, $18,000 on St. Denis, between Faillon and Villeray. Sub-trades to be let.

F. P. Dusseault, 850 Davaar, is owner and builder of $10,000 cottage on Wildey Ave., near Van Horne. Sub-trades to be let.

Outremont, Que.

Work is to start shortly for $50,000 apartment house on Joyce, near Outremont Ave. A. Julien, 714 Bloomfield St., is the owner. Architects, Perrault & Gadbois, 2100 Park Ave.

Ottawa, Ont.

Walls are going up for $8,000 residence on Grove Ave. Owner and general contractor — Brookes & Wilson, 69 Union St., who are receiving tenders on electric, heating, plastering and plumbing. No closing date set. Balance of trades by day labor.

Point Grey, B. C.

W.M. Roberts, 1949 36th Ave. W., Point Grey, is owned and builder of $7,500 residence on 19th Ave. W. No materials purchased. No sub-trades let.

Stratford, Ont.

H. F. Holman, Ontario St., is preparing plans of $7,500 residence to be built on William St., for J. M. Riddell, 136 Hibernia St.

Toronto, Ont.

Excavation work is being done for $9,000 residence and garage at 42 Glenwood Ave. Owner and builder is Frank Taylor, 182 Willard Ave. Tenders are being received for plumbing, heating, painting, plastering and electric.

Foundations are in for $12,000 duplex residence on Northcliffe Blvd. Harry J. Long, 76 Glendonwynne Ave., is the owner and builder. Tenders are being received on painting and plastering.

Excavation work is being done for $12,000 duplex residence on Rose Park Drive and Heath St., for R. D. Davidson, 184 Arlington Ave. Architect, D. H. Burnham, 260 Lauder Ave.

Tenders are being received by Thos. Taylor, 71 Vermont Ave., on electric, plumbing, painting, plastering, heating and decorating in connection with $9,500 residence and garage being built east side Humewood Ave., near High.

C. Thorne, 545 Crawford St., is owner and builder of $7,500 residence west side Wychwood Ave., near St. Clair West. Tenders are being received on hot water heating, plastering, electric and plumbing. Painting by owner, day labor.

Walls are partly up for $7,500 bungalow, east side Durie Ave., near Ardagh, for A. Tucker, 227 Fairview. Tenders are being received on heating, electric and plumbing.

Tenders are being received by the owner, A. Clark & Son, 224 Augusta Ave., on painting, electric, plastering and tiling (2 bathrooms and verandah) for 2 residences, $12,000 each, at 31-33 Austin Terrace.

McDonald & Miller, 33 Woodycrest, are the owners and builders of 1 pair residences, $7,500, south side Milverton Blvd. near Woodington Ave., and will let painting, plastering, heating, plumbing and electric. Masonry day labor.

[illegible] Ave.

[illegible] to $120,000 [illegible] corner Howland Ave. and Wells[illegible] Crescent. D. Lavoie, 305 St. Clair West, is the owner. Architects, Keith & Sprachman, 298 Dundas W. Owner and architects are receiving prices on structural steel, stone, terra cotta and roofing and lumber.

Work is to start shortly on 4 pair residences, $36,000, east side Ulster near Rhyl Ave. Chatterton Bros., 100 Ulster Ave., are the owners and builders. Masonry day labor. Plumbing, heating, plastering and painting to be let.

Tenders are being received on smaller trades in connection with $15,000 residence and garage to be built on south side Montclair Ave., near Westmount Drive. A. P. Herbert, 297 Havelock St., is the owner. Architect, D. H. Burnham, 260 Lauder Ave.

John Gillespie, 174 Sendra Ave., is owner and builder of $9,000 residence north side St. Germain Ave., near Jedburg Rd., and will let heating, electric, plumbing, plastering and painting trades. Masonry by day labor.

E. Cox, 111 Symington Ave., is owner and builder of 2 residences, $5,500 each, north side Hyde Ave., near Bicknell. Plumbing, heating, electric, plastering and painting to be let.

Work is to start shortly for 6 or 7 residences, $4,000 each, on north east corner Poulton and Woodmount Ave. Owner and builder is J. McKennan, 14 Harris Ave. Tenders are being received on plumbing, heating, electric, plastering and painting.

The walls are going up for $9,500 residence and garage, east side Humewood Ave., near High. Owner and builder is Thos. Taylor, 71 Vermont Ave. Tenders are being received on plastering, electric, plumbing and heating. Painting by owner.

H. R. Watson, 36 Toronto St., is preparing plans of alterations to residence for duplex, costing $8,000, on Prince Arthur Ave. Tenders for this work will shortly be called.

Walls are going up for $7,500 residence and garage, north side Harmont Rd., near Olympus. B. T. Huston, 208 Western Ave., is the owner and builder. Tenders are being received on plastering, electric, plumbing, heating and painting. Carpentry and masonry by day labor.

The walls are now up on $7,500 duplex residence and garage on Hepbedale Ave. Owner is G. Hoare, 177 Coburn Ave. [illegible] receiving tenders on electric [illegible]

Verdun, Que.

Daoust & [illegible] are owners and builders of 47 [illegible] cheap on [illegible] Ave. Masonry, millwork

(Continued on page 55)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

DEPARTMENT OF RAILWAYS AND CANALS

WELLAND SHIP CANAL

Section 8

NOTICE TO CONTRACTORS

Contractors are hereby notified that time for receiving tenders in connection with Contract 8, Welland Ship Canal, has been

extended to January 15, 1924,

By Order,
J. W. PUGSLEY,
Secretary
Department of Railways and Canals,
Ottawa, December 5th, 1923. 50

ESSEX BORDER UTILITIES COMMISSION

Tenders for Water Purification Plant

Sealed tenders addressed to the Secretary of the Commission will be received by the Essex Border Utilities Commission, Hintzman Building, Windsor, Ontario, up to 4 p.m. on

Thursday, December 27, 1923,

for the following contracts connected with the construction of a water purification plant in Essex Co., Ontario:

(a) Construction of reinforced concrete Filters, coagulating basins, pure water reservoir, office building etc.
(b) Supplying 42" diameter steel pipe.
(c) Supplying cast iron pipe and specials.
(d) Supplying valves and sluice gates.
(e) Supplying Rate Controllers and operating tables.

Plans and specifications can be obtained and further information secured from J. Clark Keith, Chief Engineer of the Commission, Windsor, Ontario, or from C. E. Nasmith & Company, Consulting Engineers, 125 Confederation Life Building, Toronto, Ontario.

A certified cheque for $1,000 must be submitted before plans and specifications can be obtained for the above contracts, which will be returned on tender being submitted.

A certified cheque for 5% of the tender must accompany all tenders.

These tenders will be opened at a public meeting to be held in the office of the Commission at 4 p.m. Thursday, December 27th, 1923.

The Commission does not bind itself to accept the lowest or any tender.

E. M. ERVEN,
Secretary.

LOCOMOTIVES, NEW

[illegible] gauge, 25 tons Tractive Power, [illegible] and Tenders

Very attractive prices

P. POLIAKOFF
[illegible] York, N.Y.

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

DEPARTMENT OF RAILWAYS AND CANALS, CANADA.
WELLAND SHIP CANAL

Section 8

Notice to Contractors

Sealed tenders addressed to the undersigned and marked "Tenders for Section 8, Welland Ship Canal," will be received at this office until 12 o'clock noon, on

Thursday, December, 27th, 1923,

Plans, specifications and form of contract to be entered into can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Engineer in Charge, Welland Ship Canal, St. Catharines, Ont.

Copies of plans and specifications may be obtained from the Department on the payment of the sum of fifty dollars. To bona fide tenderers this amount will be refunded upon the return of the above in good condition.

An accepted bank cheque on a chartered bank of Canada for the sum of $550,000 made payable to the order of the Minister of Railways and Canals, or War Loan Bonds of the Dominion of Canada to the same amount or War Loan Bonds and cheques if required to make up the difference, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque or bonds thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque or bonds of the successful tenderer will be held as security or part security for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By Order,
J. W. PUGSLEY,
Secretary.

Department of Railways and Canals,
Ottawa, November 29th, 1923. 49-50

Formulate Principles to Underlie Building Trade Apprenticeships

General principles which it was agreed should underlie apprenticeship training in the building trades were formulated at a conference in Washington Nov. 15 between the Federal Board for Vocational Education and representatives of employers and employees and material supply manufacturers.

Eight general principles were laid down. They are:

1—That a local representative committee composed of all interests in the industry is essential to determine the needs and supervise the training.

2—That part time or evening schools should be provided to supplement job training.

3—That all-around training is more desirable than specialized training.

4—That the national associations should set up fundamental training standards for apprentice training and make the information thereon available for instructional purposes.

5—That co-operation with the public schools is essential to the promotion of apprentice education.

6—That incentives should be set up to induce boys to enter apprenticeship.

7—That pre-employment training for employed apprentices or boys under contract is recommended.

8—That emphasis should be placed on dull-season training to follow up the initial training given in the pre-employment period.

A number of those attending the conference, which was called for discussion of the apprenticeship problem rather than for immediate definite action, recited plans which have been followed in various trades at specific localities to induce more young men to enter apprenticeship, or which have been devised to be put into operation soon.

DEPARTMENT OF TRADE AND COMMERCE, CANADA

Elevator Pile Foundation, Edmonton, Alberta

NOTICE TO CONTRACTORS

Sealed tenders addressed to the undersigned and marked "Tender for Pile Foundation, Edmonton Elevator," will be received at Ottawa until twelve o'clock noon, on

Friday, December 28, 1923,

Plans, specifications, and forms of contract to be entered into can be seen at the office of C. D. Howe & Company, Consulting Engineers, at Port Arthur, Ontario, and at Edmonton, Alberta. Copy of plans and specifications may be obtained from C. D. Howe & Co., on application by bona fide tenderers.

An accepted bank cheque on a chartered bank of Canada for the sum of $5,000 made payable to the Minister of Trade and Commerce must accompany each tender which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security or part security for the due fulfillment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
F. C. T. O'HARA,
Deputy Minister.

Department of Trade and Commerce,
Ottawa, December 10, 1923. 50

Residences

(Continued from page 53)

roofing, electric, plumbing, plastering and painting to be let.

Foundations are in for $7,000 residence on LaSalle Rd. Jerome Masse, 170 First Ave, is owner and builder. Roofing, electric, plumbing and plastering to be let. Masonry, painting and glazing by day labor.

J. C. Monpetit, 630 Evelyn St. is owner and builder of $7,000 residence on Verdun St. Masonry, millwork, roofing, electric, plumbing, plastering and painting to be let. No materials purchased.

Windsor, Ont.

O. Knapp, 103 Baby St., Sandwich, Ont., is the owner and general contractor of $8,500 duplex residence being built on Goyeau St. No material purchased. Painting, electric, plumbing and plastering to be let.

CONTRACTS AWARDED

Galt, Ont.

The following sub-trades have been let on $7,000 residence corner Brant Rd. and Salisbury Ave., for Dr. J. H. Radford, 26 Colborne St.; carpentry—P. Nichol, 28 Blair Rd.; electric—W. H. Hernsey, 55 Dickson St.; painting—A. G. Bruce, 18 Queens Sq. Other trades not let. H. Thomas & Son, 45 Dickson St., are the general contractors.

Kitchener, Ont.

C. Dankwart, Mill St., has the contract for masonry work on $6,000 residence being built on Lancaster St. Chas. Williams, 213 Mill St., is the owner and builder.

The walls are going up for $4,500 residence on Mill St. C. Dankwart, Mill St., is the owner and general contractor. Roofing, Ed. Schnarr, 41 Elgin St. Painting and glazing by day labor.

London, Ont.

Webster Construction Co. have the general contract for $7,000 residence to be built on Bridgeport St., for F. G. Hill, care general contractors.

Mount Royal, Que.

H. R. Cassidy, 255 Regent St., has the contract for electrical work on 4 residences, $32,000, near Montreal, for Model City Housing Co., Montreal. General contractors are Bremner Norris & Co., Ltd.

The following sub-trades have been let on 4 residences, $30,000, being built near Montreal, for Model City Housing Co. Montreal; electric—Marcou & Frere, 450 Roy E.; plastering—J. Villeneuve, 3534 St. Denis St.; painting and glazing by general contractor, Bruno St. Pierre, 3448 Henri Julien Ave., Montreal.

Montreal, Ont.

N. Lapierre, 618 Fabre St., has the plastering contract on 2 residences, $15,000, being built on St. Valier, between Belanger and Isabeau, for E. Leonard, 3035 Christophe Colomb. J. Labelle, 3528 Christophe Colomb is the general contractor.

W. Rutherford & Sons Co., Ltd., have the contract for millwork, and O. Bergeron, 168 Beaudry St., the ornamental iron contract, for 28 residences, $150,000, being built on Redpath, between Sherbrooke and pine ave. Senneville Development Co., Ltd., are the owners and builders.

The following sub-trades have been let on $20,000 residence being built on Pine Ave., between Cote des Neiges and Simpson, for G. I. Drummond, 134 Notre Dame West; marble and tiling—G. R. Locker, 143 Mansfield St.; roofing—Richardson Simard & Co., painting and glazing—A. Craig Ltd.; plastering by general contractor, J. MacGregor, Ltd., 44 Closse St.

The following sub-trades have been let on 4 residences, $35,000, on Patricia, between Terrebonne and Somerled; millwork—Riopel & Frere; roofing—D. Nicholson & Co.; electric—A. Demers, care owner and builder, J. S. Brown, 324 Patricia; plumbing and heating—L. N. & J. C. Noiseux. Masonry, plastering and painting by day labor.

Brickwork is going up on stores and flats being built north east corner Gray and Sherbrooke, for Nathan Shrubman, 5056 Sherbrooke W. The following sub-trades have been let; masonry—J. Toralli, 186 St. Margaret St.; millwork—J. Meunier, St. Jerome, Que.; plumbing—J. Tweddle, 163 Lagauchetiere. Architects, Shorey & Ritchie, 360 Beaver Hall Hill.

The following sub-trades have been let on 2 residences, $18,000, on Northcliffe Ave. Notre Dame de Grace; roofing—D. Nicholson & Co.; electric—P. Houle, 351 Angers; plumbing and heating—J. B. Staton, 2542 Mance; tiling—J. H. Dodgson, 745 Catherine W.; plastering—A. Leger, care owner and builder, Pick & Sheppard, 360 Hingston.

A. Gregoire, 417 Addington, has the general contract for residences and 2 garages, $25,000, on Park Ave., near St. Viteur, for E. Emery, 4280 Western. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

Foundations are going in for 2 residences, $24,000, on Mt. Pleasant, near Trafalgar, for J. C. Rancourt, 3820 St. Laurent. General contractors are Denis Construction Co. Masonry, millwork, roofing, electric, plumbing, heating, plastering, painting, glazing, tiling and hardwood floors to be let.

Niagara Falls, Ont.

Smith Bros., Ellen Ave., are the general contractors for 2 stores and 4 apartments, $30,000, corner River Rd. and Bridge St., for Ed. M. Noonan, River Road.

Outremont, Que.

Forms are going in for $28,000 cottage on Peronne Ave. N. Deslauriers, 406 Sherbrooke East is the owner. Architect, Chas. Bernier, 70 St. Jacques. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, and tiling to be let.

Foundations are going in for 2 residences, $9,000, on Dunlop, near Ducharme, for C. P. Tucker, 2392 Hutchison. H. Taylor, 2634 Christophe Colomb is the general contractor. Sub-trades to be let.

The following sub-trades have been let on $27,000 cottage being built on Maplewood, corner McCulloch, for Jas. Moguin 1158 St. Hubert St.; roofing—M. Chouinard, 751 Adam; plastering, Frs. Beaudoin & Fils, 62 Christophe Colomb. General contractors are Collet & Freres, 243 St. Hubert St. Architects, Perrault & Gadbois, 2100 Park Ave.

Paul & Calvert, 31 Mercantile [illegible] the roofing and plastering contract [illegible] of three $4,000 cottages on Wroxham Rd., Hudson, for J. [illegible] Contractor on [illegible] tect E. A. Dunn [illegible] Contractors for O. Rondeau, 11[illegible] St. Denis St., are general contractors. Balance of work day labor.

The following sub-trades have been let on $10,000 residence being built on Elmwood Ave., for Geo. Gundry, 2010 Hutchison St., brickwork—B. Carfa, 10 Dante; plastering—B. Mazer, care general contractors, Deng Construction Co.; tiling—R. S. Muir, 2 Park Ave.

Ottawa, Ont.

The walls are going up for $7,000 residence on Powell Ave. Following sub-trades have been let, electric—J. Ellicott Bank and Strathcona Ave., plumbing and heating—Band & Cole, Bank and Third Ave., plastering—W. Green, 105 Arlington Ave., painting—Mr. Stroud, Bank St. G. B. O'Hara, 30 Fouth Ave., is the owner and general contractor.

Port Colborne, Ont.

Otto Eberling contemplates building 2 residences, $3,500 each, on Alexandria St. Peter Beam has the contract for masonry. Carpentry day labor by owner. Sub-trades to be let.

Toronto, Ont.

J. Cook, 166 Concord Ave., has the contract for plumbing, and Frank Marette, 21 Wattord Ave., the plastering contract, on 3 residences, $16,000, being built at 41-3-5 Melrose Ave. Painting by day labor. Owner and builder is Jno. Hambleton, 205 Yonge St.

The following sub-trades have been let on 1 pair residences, $7,500, west side Kingswood Rd., near Gerrard East; plumbing—Joe. Foster, 862 Kingston Rd.; heating—Rumley & Thompson, 396 Kingston Rd. Painting and masonry by day labor. Geo. Cross., 116 Kingston Rd., is owner and builder.

The following sub-trades have been let on 4 residences, $3,500 each, south side Snowden Ave., near Bocastle Ave., electric—Taylor Bros.; plumbing—Chas. Legg, 120 Barrington St.; heating—Toronto Furnace Co.; painting—Ingram Bros.; plastering—W. Baker, 90 Main St. Owner and builder is J. E. McMillan, 164 Main St.

Sub-trades as follows have been let on 2 residences, $4,500 each, south side Snowden Ave., near Yonge St.; electric—H. Wood, 104 Nairn Ave.; plumbing—W. H. Raine, Glengrove E.; heating—L. C. Carstead, 9 Redpath Ave.; plastering—B. B. Boyl, 147 Ascot Ave. Painting by day labor. Owners and builders are Mitchell & Sheppard, 101 Eglinton.

Walls are going up for 2 pair residences, $6,000 a pair, south east corner Snowden and Roman Ave. Owner and builder is W. E. Taylor, 22 Falcon Ave. Masonry is being done by Langman & Taylor, 500 Soudan Ave. Carpentry by day labor. Electric, plastering [illegible] heating and plumbing to be let.

The following sub-trades have been let on $15,000 residence being built on north side Mount[illegible] Ave., between Mason & Allen and Mosley Ave., [illegible] tractor, Leland [illegible] Ave. Plastering to be let. Painting by owner and builder, W. [illegible] Bank Ave.

Art [illegible]

Walls are going up for $10,000 residence and garage south side Dundurn Crescent, near Dundurn Ave., for C. LeCaan, Northcliffe Blvd. J. W. Crowe, 24 Glenwood Ave., is the general contractor and is receiving tenders on electric, plumbing and heating. Carpentry and masonry by general contractor, day labor.

Gordon & Harmer, 110 Montgomery Ave., have the painting contract, and Howard Furnace Co., the heating contract, for 2 residences, $4,000 each, at 103-5 Glenforest Ave. Irwin Simpson, 11 St. Leonards Ave., is the owner and builder. Plastering by day labor.

J. Bond, 336 Keewatin Ave., has the plumbing contract for 2 pair residences, $8,000 pair, south side Teddington Park Ave. near Bocastle. All smaller trades to be let. Owner and builder is Herb. R. Wilton, 86 Teddington Park Ave.

The following sub-trades have been let on $8,000 residence being built north side Teddington Park Ave., near Yonge St., for F. W. Rea, 71 Heath St. W.: electric—F. B. Swackhamer, 1167 Bay St.; plumbing—John T. Aggett, 10 Scollard Ave.; plastering—Walter Simpson, 487 Eglinton Ave.; heating (oil burner)—Wm. Howard, 43 Howland Ave. Painting by day labor.

Vancouver, B. C.

The following sub-trades have been let on alterations for apartment block, $270,000 500 block, Georgia St. W., owned by St. Julien Co., Ltd.; roofing, sheet metal and ventilating—Campbell & Grill; electric—general contractors, Booker, Campbell & Whipple. Architect, H. S. Griffith, 1013 Dominion Bldg., Vancouver.

The following sub-contracts have been awarded on $21,000 apartment block on Harwood Street, owned by Hugh M. Fraser & Co., Ltd.; plumbing—Frederick Woods, 1420 Seventh Ave. E.; heating (gas) Vancouver Gas Co. General contractors are Smith & Webber; architect, H. H. Simmonds, 309 Carter Cotton Bldg., Vancouver.

Verdun, Que.

Foundations are going in for 12 flats, $24,000, on 4th Ave., for Piche & Raymond, 83 Lasalle Rd. Jos. Soucisse, 1332d Wellington St. has the general contract. Masonry, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, marble and tiling to be let.

F. X. Ledoux, 97 Edna, has the general contract for $9,000 residence on Willibrod Ave., for Rev. P. McDonald, 335 Willibrod. Masonry, millwork, roofing, electric, plumbing and plastering to be let. No materials purchased; general contractor buys.

The following sub trades have been let on 20 flats, $60,000, being built on Ballantyne between 3rd and 4th Aves.: roofing—Jos. Labelle, 499 Atwater; electric—S. Quesnel, 309 Church Ave.; plumbing and heating—Mr. Lambert, care owner and builder, Jos. Soucisse, 1484 Wellington; painting and glazing—A. Raymond & Co.; masonry, day labor. Marble, millwork, plastering and tiling to be let.

The following sub trades have been let on $12,000 residence being built on Second Ave., masonry—A. Remy, 1313 Ormiston St., roofing—Jos. Labelle, 258 LaSalle Rd., electric—E. Robillard, 1446 St. Joseph St.; plastering—A. Leonard, 54 Pichette. Owner and builder—Perras & Foulet, 1501 Wellington St.

Westmount, Que.

D. Nicholson & Co. have the roofing contract, and Brown & Son, the tiling, for pair residences, $30,000, on south side Cote Road, between Prince Albert & Victoria. Owner and builder is Pick & Reid, 919 Durocher.

The following sub-trades have been let on 1 pair and 1 detached residence being built on upper Lansdowne Ave.; millwork—Daniel Cream Lumber Co.; roofing—D. Nicholson & Co.; electric—P. Houle, 351 Angers; plastering—Frs. Beaudoin & Fils. Masonry, plastering, painting and glazing by owners and builders, Pick & Sheppard, 360 Hingston.

Duntile Co., Ltd., 499 Phillips Sq., have the contract for masonry on 1 pair residences, $30,000, being built on Aberdeen Ave. J. B. Fellows, 60 Nelson, is the owner and builder. Millwork, roofing, electric, and tiling to be let.

Foundations are in for 1 pair residences, $30,000, on Prince Albert Ave. Millwork—W. H. White, 77—1st Ave., Ville St. Pierre. Owner and builder is J. Hand, 4857 Sherbrooke Ave.

W. H. White, 77 First Ave., Ville St. Pierre, has the contract for millwork on $20,000 residence being built opposite 916 Grosvenor Ave. J. Hand, 4857 Sherbrooke Ave. W., is the owner and builder. Roofing, electric and tiling trades to be let.

Waterloo, Ont.

Harvey Gleiser, 7 Erb St. W., has the plumbing contract for $5,000 residence being built on Park Ave. Ellert Bros., Park Ave., are the owners and general contractors.

Windsor, Ont.

Gignac Bros., 932 Parent Ave., have the general contract for $7,500 duplex

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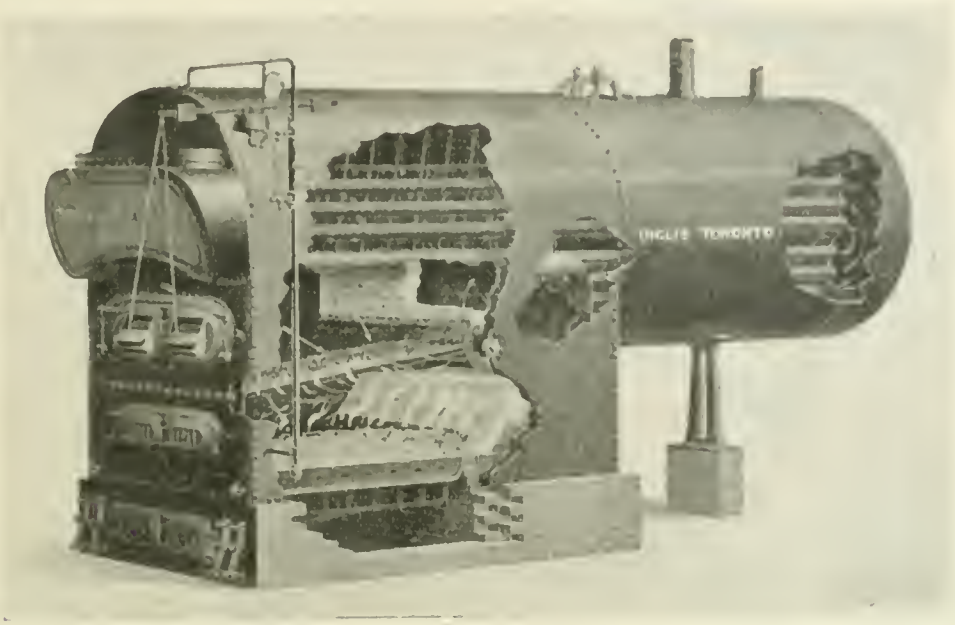

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residence on Giles Blvd., for C. E. Baby, Askin Ave., Sandwich, Ont. Electric, plumbing, plastering and painting to be let. No materials purchased.

Arthur Pickering, Hall Ave., has the contract for plumbing and heating on $7,500 duplex residence on Howard Ave. Owner and general contractor is Peter Osterhout, Exchange Building. Electric, plastering and painting trades to be let.

Power Plants, Electricity and Telephones

Chippawa, Ont.

Hydro Electric Power Commission of Ontario, is receiving tenders till December 13, through the chief engineer, for construction of 2 rest piers, 2 guard piers and 2 fenders in connection with M. C. R. swing bridge over Welland Canal at Chippawa. Plans and specifications with T. U. Fairlie, railway engineer, corner Centre Ave. and Elm Sts., Toronto.

London, Ont.

A By-law for the rebuilding of dam to cost $150,000 was defeated by the London ratepayers on December 3.

CONTRACTS AWARDED

Vancouver Island

B. C. Electric Railway Co., Ltd., Vancouver, have awarded Samuel Crooker, Duncan, B.C., the contract for supplying poles at $10,000, in connection with extension of high power line between Jordan River and Brentwood Bay.

Winnipeg, Man.

The city of Winnipeg has awarded the general contract for transformers to Packard Electric Co., at $2,988.

Miscellaneous

St. Catharines, Ont.

The Dept. of Railways and Canals, through the secretary, J. W. Pugsley, Parliament Bldgs., Ottawa, Ont., is receiving tenders till Jan. 15, 1924 for general construction work in connection with section 8, Welland ship canal.

Plans and specifications at office of chief engineer, Dept. of Rlys. and Canals, Ottawa, and engineer in charge, Welland Ship Canal, St. Catharines.

An accepted cheque for $550,000 is required.

Macdonald Engineering Co. of Canada, Ltd., C.P.R. Building, Toronto, Ont., are submitting a tender in connection with construction of section No. 8, Welland ship canal, and would like to receive prices on sub-trades.

Verdun, Que.

J. E. A. Benoit, 1200 Wellington St., W., Verdun, Que., wants prices at once on artificial stone (first quality); hot air furnace, mosaic flooring and leaded and frosted glass.

An extensive highway improvement project is going forward in Argentina. The project provides for the progressive construction of over 6,000 miles of highway within the single Province of Buenos Aires.

BURLINGTON STEEL COMPANY LTD.

Hamilton, Canada

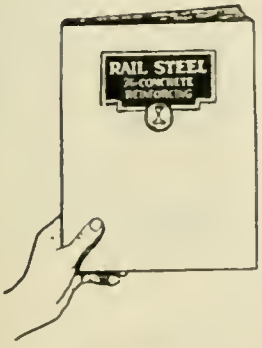
Canadian Pacific Railway Company's Lake Terminal Elevator

The Canadian Pacific Railway's 4,000,000 bushel Reinforced Concrete Grain Elevator is located at Port McNicoll, Ont. It was designed and built by the John S. Metcalf Co. Ltd., of Montreal, and this modern and fire-proof Elevator is one of the finest in Canada.

The storage capacity is made up of 64 circular bins, 33 feet inside diameter by 80 feet in height, and has 62 interspace bins. There is also a large Working House, two travelling marine towers and Power Plant with two turbo-generators.

Due to its height and its location in the open along the Lake front, this Elevator is necessarily subjected to enormous wind pressure as well as the vibration of the Railroads operating on the ground and the machinery and conveyor equipment operating within. To meet these conditions the Engineers chose RAIL STEEL REINFORCING manufactured from standard section Tee Rails in accordance with A.S.T.M. SPECIFICATION A-16-14, and CANADIAN ENGINEERING STANDARDS ASSOCIATION Specification A-9-1923-B.

700 tons of RAIL STEEL BARS were used to reinforce this Structure.



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Exporters Should Watch Translation

Faulty and incorrect translations of circulars and advertisements not only fail to convey the meaning intended by the manufacturer or exporter but frequently make a company ridiculous in the eyes of the prospective purchaser. Some years ago a saddlery manufacturer, anxious to advertise his goods in Spanish speaking countries, sent out pamphlets concerning single horse buggy harness which he had for export. The translator, having no idea of the subject under consideration, made a true literal translation ,and the result was "Harness full of bugs, for a bachelor horse." Vacuum cleaners have been made "cleansers of emptiness;" monkey-wrenches, "wrenches for monkeys;" iron washers, "machines to clean iron." The London Times Supplement has also recently called attention to the fact that translators in several instances have been guilty of deliberate errors in translating circulars into little-known vernaculars The result was that competitors of the concern in question were aided in the introducing of their own or similar products in the country. This was done by the addition of cryptic expressions known only locally.—Financial Post.

Prospect for Digging Artesian Wells At Guadeloupe

Manufacturers of artesian well digging machinery and equipment will be interested in a project which is being considered for the solution of the drought problem in certain islands of the West Indies by means of artesian wells. While no definite proposition is at hand it is believed there is a very good opportunity for the sinking of such wells at considerable profit to some concern which will go into the matter on a large scale (or blanket basis), making a survey of conditions tnd needs and offering a proposition that will supply the full demands. That such an opportunity exists for an elert engineering concern is evidenced by the fact that Guadeloupe is suffering not only for lack of water for irrigation purposes but because there is a poor supply of water fit for drinking purposes.

Modern Hotel for Czechoslavakia

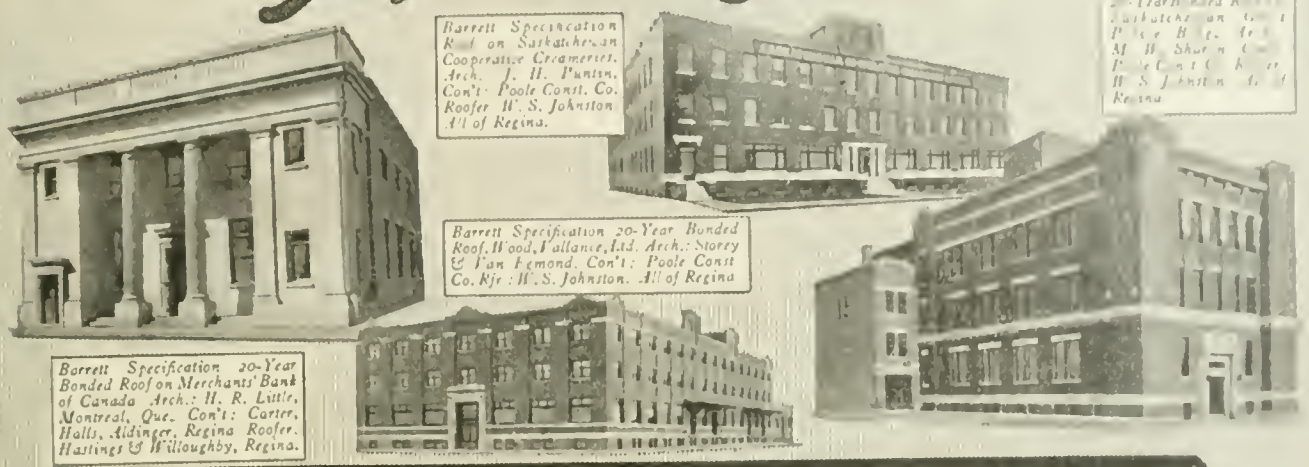
A project to construct a modern hotel along American lines in Prague is being actively pushed by an American group with the co-operation of a number of prominent Czechs. The proposed building will have a minimum of six, but more likely eight or nine, stories, with upward of 400 rooms, the estimated cost to be approximately $2,500,000. Of this sum the Americans propose to raise approximately one-half and the balance is to be provided by local interests. Reference No. 12558.

Governments Dispose of Peat Ulant

Private interests it is understood have offered to take over from the Ontario and federal governments the peat plant at Alfred, Ont., and to operate it on a commercial basis. No cash consideration is involved, the company merely stepping in to take charge of the plant, giving guarantees that the plant will be operated and the fuel distributed in the surrounding district.

Barrett Specification Roofs

Bonded for 20 and 10 Years



Barrett Specification Roof on Saskatchewan Cooperative Creameries. Arch.: J. H. Puntin. Con't: Poole Const. Co. Roofer W. S. Johnston All of Regina.

Barrett Specification 20-Year Bonded Roof, Wood, Vallance, Ltd. Arch.: Storey & Van Egmond. Con't: Poole Const Co. Rfr: W. S. Johnston. All of Regina

Barrett Specification 20-Year Bonded Roof on Merchants' Bank of Canada Arch.: H. R. Little, Montreal, Que. Con't: Carter, Halls, Aldinger, Regina Roofer. Hastings & Willoughby, Regina.

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REGINA, the capital of Saskatchewan and the commercial metropolis of the great Northwest, is the fastest growing city in this pushing, prosperous territory. All types of buildings house its varied activities. And it is noteworthy that most of Regina's substantial structures are covered with Barrett Specification Roofs.

For the architects of Regina know that back of The Barrett Specification Roof stand these four factors:

The Barrett Specification—for flat (or nearly flat) roof construction drawn up by Barrett technical men with the cooperation of leading architects, engineers and contractors.

Standardized materials—The Barrett Specification rigidly prescribes the quality and quantity of materials.

The Man who lays the roof—Only a man with an earned reputation for good work can obtain the surety bond for the owner of the building.

The Barrett Inspection—Highly trained Barrett technical men are on the job to see that The Barrett Specification is followed in every detail. Only after their O.K. has been received is the Bond issued.

Investing in a definite period of guaranteed service is the modern, efficient way of buying roofs. And that means a Barrett Specification Roof.

There are two types of Barrett Specification Roofs—Type "AA," bonded for 20 years; Type "A," bonded for 10 years. Both are built of the same high-grade materials, the only difference being in the quantity used.

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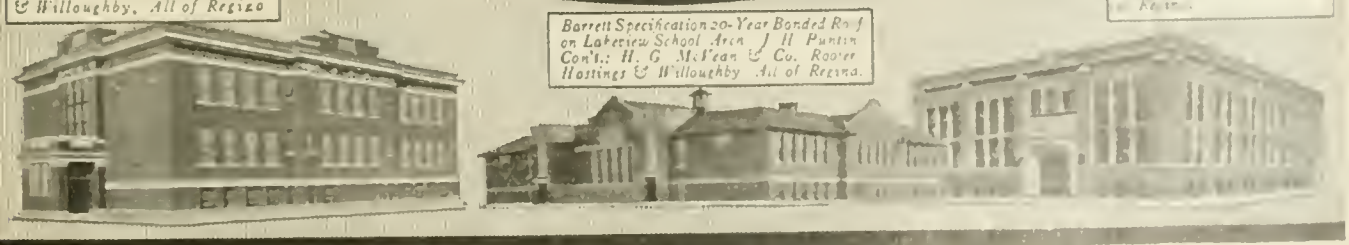
Barrett Specification 20-Year Bonded Roof on Kitchener School. Arch.: J. H. Puntin Con't: Wilson & Wilson Roofer. Hastings & Willoughby, All of Regina

Barrett Specification 20-Year Bonded Roof on Lakeview School Arch. J. H. Puntin Con't.: H. G. McLean & Co. Roofer Hastings & Willoughby All of Regina.



Current Prices of Building and Engineering Materials

	Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—				
Retail lots including bags, delivered ..per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding ....per bbl.	3.45*	3.48	4.20	4.20
Refund on bags .....each	.20	20	.20	.20
LIME				
Lump, in retail lots, delivered ....per ton	14.30	13.00	.58 bu	2.70 bbl
Lump, in car lots f.o.b. siding .....per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered .....per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding .....per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered .....per ton	18.75	19.00		
BRICK and TILE (Delivered on job):—				
Common face brick .....per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick .....per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick .....per M.	28.50	25.00	32.00	
Enamelled brick .....per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work .....per M.	21.00	19.00		40.00
Sand lime brick .....per M	17.00		18.00	19.00
Hollow building tile .....per M.			8-12c. per ft.	105-240,00
Paving brick imported .....per M.	on appl.	100.00	55.00	60.00
Fire brick .....per M.	68-95	60-75	85-100	70.00
Fire clay .....per ton	13-20	15-16.00	35.00	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—				
Crushed stone, 2 in. .....per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under .....per ton	2.31	1.90	2.75 "	" "
Crusher run .....per ton	2.20½		3.00 "	" "
Rubble stone .....per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened .....per ton	1.84		2.45 yd.	" "
Gravel 1 in. screened .....per ton	2.05	1.50	2.75 "	" "
Sand, screened .....per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run .....per ton	1.52¼	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—				
Mild steel bars, ¼ in. and heavier .....per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter .....per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops .....per 100 lbs.	5.00 "	5.00 "		
Angles, channels and tees under 3 in. .....per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes .....per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier .....per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in. .....per 100 lbs.	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge .....per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge .....per 100 lbs	5.60 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge .....per 100 lbs.	6.75 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge .....per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets .....per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe .....per ton	67.50	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—				
Sewer pipe, 4 in. .....per ft	.40	.30	.35	.35
Sewer pipe, 6 in .....per ft.	.60	.45	.40	.35
Sewer pipe, 8 in. .....per ft.	.80	.70	.60	.45
Sewer pipe, 9 in. .....per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in. .....per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in. .....per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in. .....per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in. .....per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in. .....per ft.	4.00	3.00		1.90
Sewer pipe, 24 in. .....per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in .....per ft	.60	.50		.50
Tile wall coping, 12 or 13 in. .....per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in. .....per ft	.70*	.60	.55	.40
Flue lining, 8½ x 13 in. .....per ft	1.00*	.90	.65	.75
Chimney tops .....each	9.00	14.00	7.50	4.50-6.00
Discounts	45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT—*Discount of 10 cts. per bbl. in 20 days from date of shipment
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BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
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Flooring, 1 x 4 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 4 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, 3/8 in. clear	per M.	120.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Fine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	41/45	10.00	36.00	11.50-18.75
Fir 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	45/60	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	13.50	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.00	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.20	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.17	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.50	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.60
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.76	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.76	.55–.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.66	.65	.50	.90
Laborers (Common)	per hr.	.40–.50	.30	.42½	.50-.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

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"Estimating Building Costs," by Charles F. Dingman, first edition, published by McGraw-Hill Book Company, Incorporated 240 pages. Price $2.50.

"Hand Book of Hydraulics," by Horace Williams King 1st edition published by McGraw-Hill Book Co., Inc. 421 pages. Price $2.50.

"Operation and Maintenance of Irrigation Systems," by S. T. Harding. First edition, published in 1917 by the McGraw-Hill Book Co., Inc. 271 pages, illustrated. Price $1.50.

"Practical Road Building," by Charles E. Foote. Just published by David McKay, 295 pages, illustrated. Price $1.50.

"Reinforced Concrete Construction", Volume 1, by George A. Hool, S. B. Second edition, published in 1917, 254 pages, illustrated. Price $2.50.

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"Sheet-Metal Pattern Drafting and Shop Problems," by James S. Daugherty. Published in 1922 by The Manual Arts Press, 173 pages, illustrated. Price $2.50.

"Steel Bridge Designing," by Melville B. Wells, C.E. Published by Myron C. Clark Publishing Company in 1913. 260 pages, illustrated. Price $1.00.

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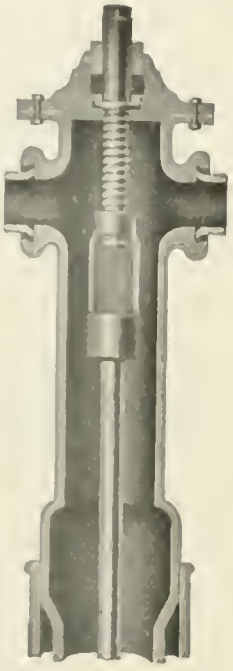

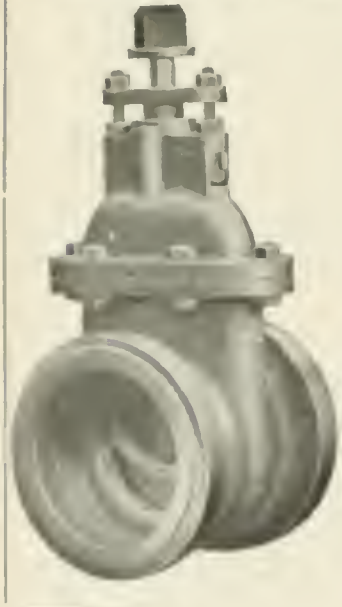

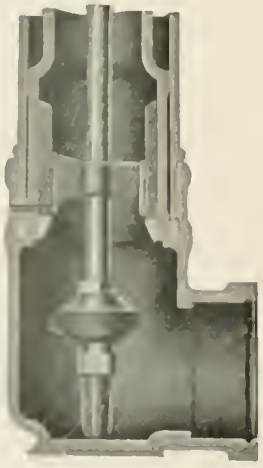

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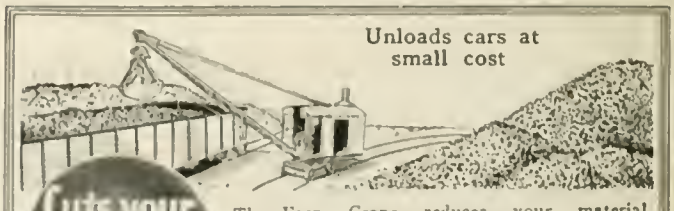

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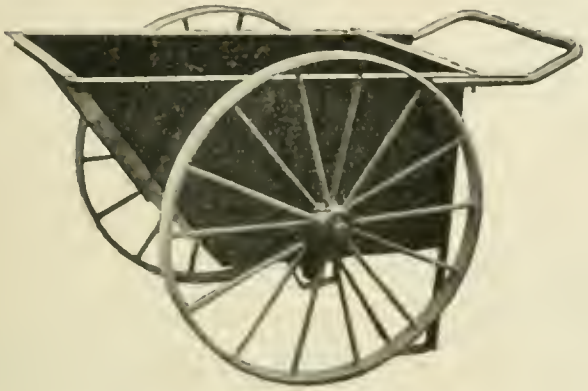

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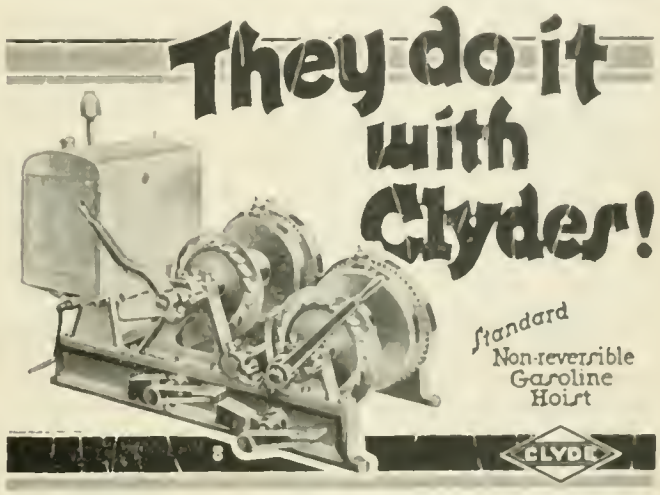

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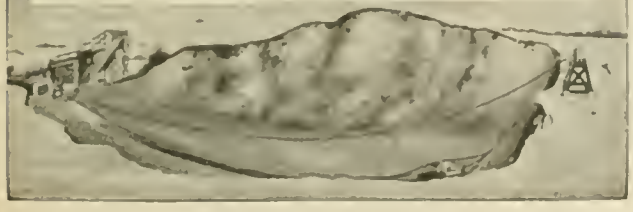

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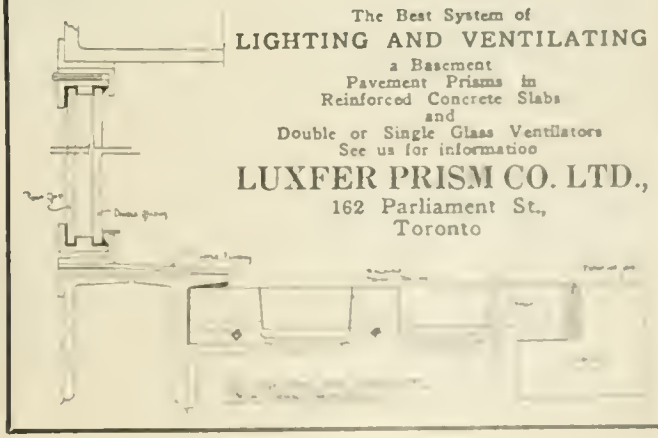

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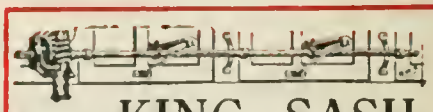
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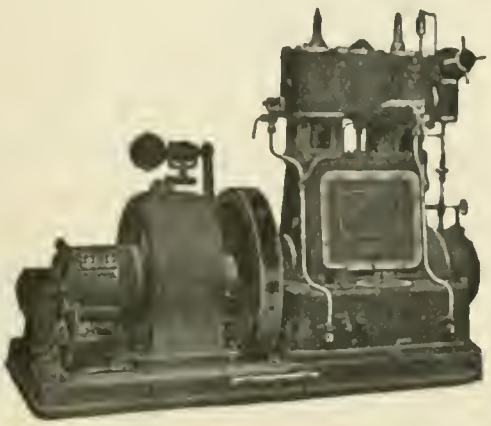

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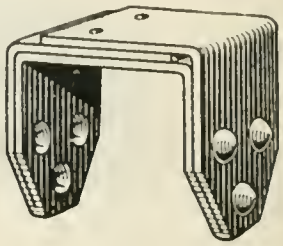

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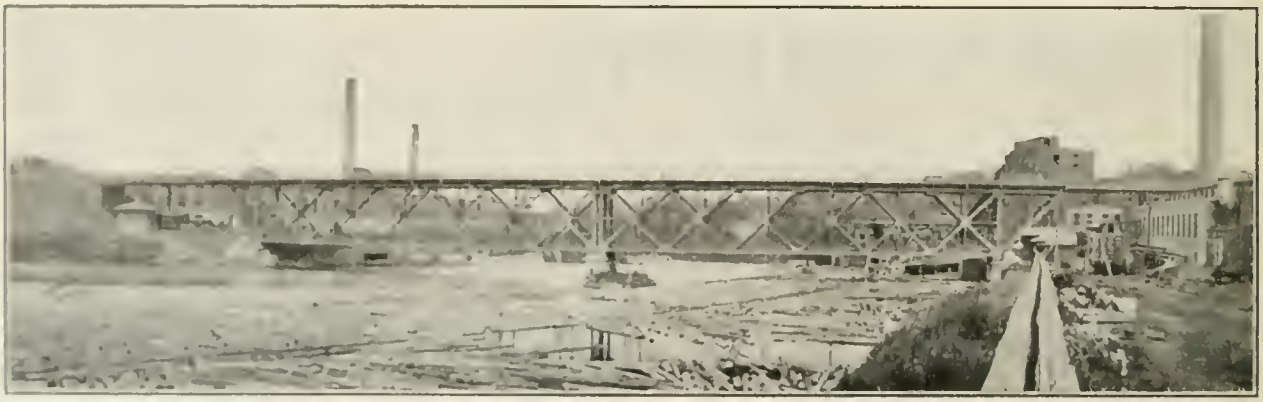

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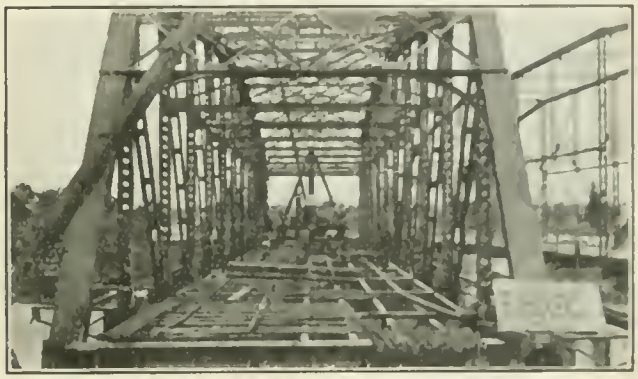

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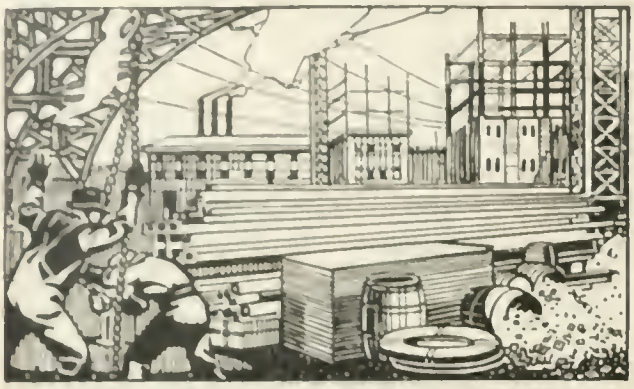

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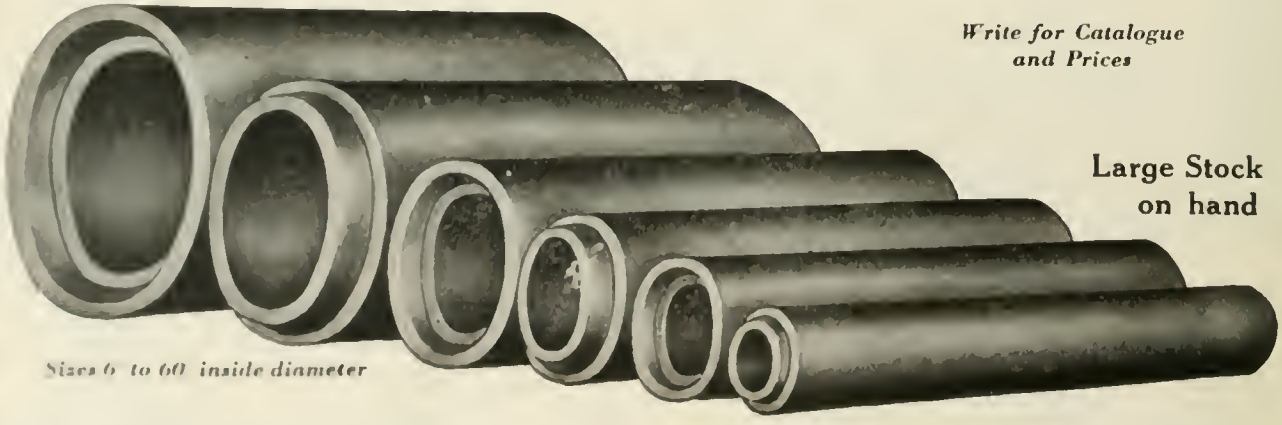

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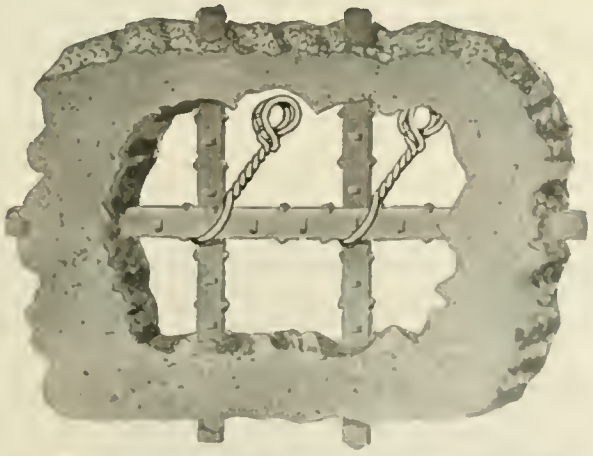

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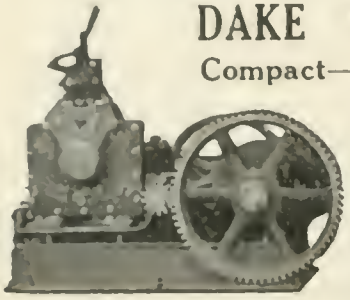

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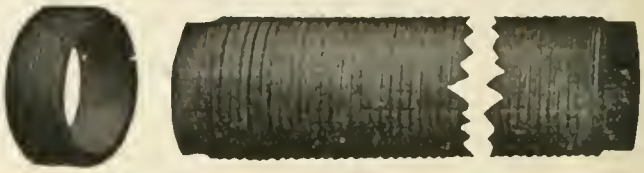

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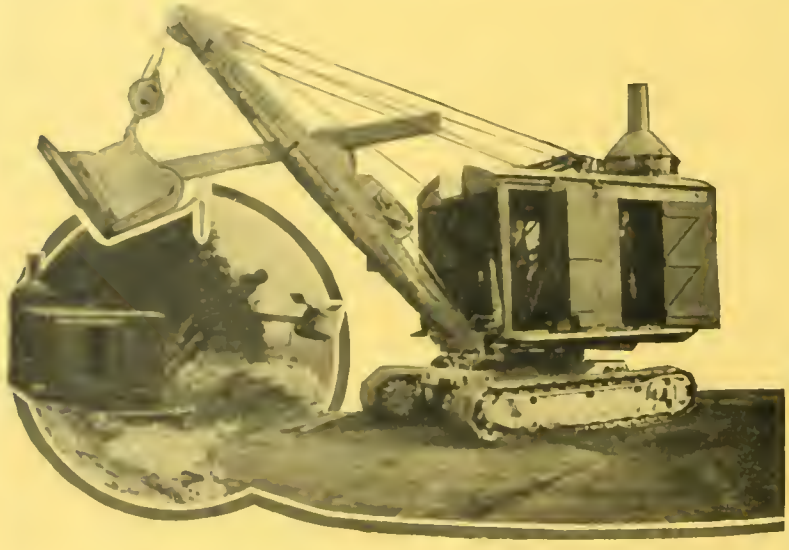

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